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A NEW TABLE OF LAPLACE TRANSFORMATION PAIRS

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ABSTRACT

This Laplace transform table contains 1024 possible transformation pairs in nine sections. The equation number indicates the order of the polynomial in the denominator of F(s) except in Sections 1 and 9. Equations in Section 1 are the most commonly invoked rules and relationships. In Section 9 the inverse transformation equation is presented in a form suitable for digital computer programming.

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I. INTRODUCTION

The Laplace transformation techniques have taken precedence in present-day operational mathematics due to the ease with which the equations describing the dynamics of linear systems are obtained. In essence, the Laplace transformation merely converts a linear differential equation into an algebraic equation, the solution of which are its roots. The inverse Laplace transformation merely defines the correspondence between these roots and the solution to the original differential equation.

In 1951, the author compiled a short table of Laplace transformation pairs which was published by Douglas Aircraft Company. The increasing popularity of this table led the author to compile the present one which represents a total of 1024 possible transformation pairs. This later work was done during the author's association with Vara Dynamics Company.

The choice of the form of the function F(s) appearing in the present table was dictated by two major considerations:

1. No multiple-order pole greater than the second order was chosen because seldom are dynamic systems found which require a higher value.

2. No characteristic polynomial denominator of F(s) greater than the seventh order was included because, from practical considerations, the numerical value of the inverse Laplace transformation of a system described by a polynomial greater than the seventh order is more readily obtained by digital or analog techniques.

II. LAPLACE TRANSFORMATION

1. Application

The Laplace transformation* is defined as follows:

$$F(s) = \int_0^\infty f(t)\, e^{-st}\, dt \qquad (1)$$

where $f(t)$ is the function of time being transformed; $F(s)$ is the "transform," a function of the complex variable s; and

$$\int_0^\infty e^{-st}\, dt$$

is the Laplace transformation "operator."

The forward transformation of a given function of time may either be obtained by application of the above given operator, or by referring to the numerous works on the subject (see references 2, 3, 4, 5, 6, 7).

This table, however, is concerned with the inverse transformation, defined by

$$f(t) = \frac{1}{j\,2\pi} \int_{c-j\infty}^{c+j\infty} F(s)\, e^{st}\, ds \qquad (2)$$

---

* In this table we shall deal with the one-sided Laplace transformation, as contrasted to the two-sided transformation (see reference 1) defined by

$$\int_{-\infty}^{\infty} f(t)\, e^{-st}\, dt$$

which takes into account the behavior of the system for all negative as well as all positive values of the independent variable (usually time). The reason for this choice is that for the systems that are most commonly considered the solution of interest is that corresponding to real values of time, and which assumes knowledge of the initial conditions, i.e., the dynamic characteristics of the system at $t = 0$.

with the restriction that no singularities exist to the right of the path of integration. The conditions referring to the discontinuities at the boundaries (in the time domain) are fully covered in references 1 and 2.

The main restrictions pertinent to this table are that $f(t)$ is defined only for $0 \leq t$, and also that in all cases $a_m < C$, where a_m represents the real part of the roots of the denominator of $F(s)$.

In particular, if the dynamic systems considered are such that $a_m < 0$ and $f(t) = 0$ for $t < 0$ (i.e., the system is stable and starts from rest) then equation (2) reduces to

$$f(t) = \frac{1}{2\pi} \int_{-\infty}^{\infty} F(j\omega)\, e^{j\omega t}\, d\omega \tag{3}$$

where $s = \sigma + j\omega$ and $\sigma = 0$, which is recognized as the bilateral inverse Fourier transformation.

Any attempt to directly integrate the function $F(j\omega)$ in its given form would normally be too difficult. This is avoided, however, by making use of Cauchy's integral formula which states that

$$\frac{d^n}{da^n}\left[h(a)\right] = \frac{n!}{j\,2\pi} \int_C \frac{h(z)}{(z-a)^{n+1}}\, dz \tag{4}$$

where C represents the closed region of integration around the singular point (in this case the entire left-hand plane), and a represents the particular singular point of the integrand, the locus of a being within the bounded region. The only requirement, then, is that the function to be operated upon be expressible in the form specified by the integrand. Consider, for example, the function

$$F(s) = \frac{s + a_o}{(s + a)^2} \tag{5}$$

The inverse Laplace transformation of this function is defined operationally by

$$f(t) = \frac{1}{j\,2\pi} \int_{-j\infty}^{+j\infty} \frac{s + a_o}{(s + a)^2}\, e^{st}\, ds \tag{6}$$

From Cauchy's integral formula (equation 4),

$$-\frac{d}{da}\left[h(-a)\right] = \frac{1}{j\,2\pi} \int_C \frac{s + a}{(s + a)^2}\, e^{st}\, ds \tag{7}$$

The integral on the right-hand side of equation (7) may be subdivided into two line integrals (see reference 8), namely,

$$\int_C ds = \int_{-j\infty}^{+j\infty} ds + \int_{\pi/2}^{3\pi/2} d\theta \tag{8}$$

as shown in Figure 1.

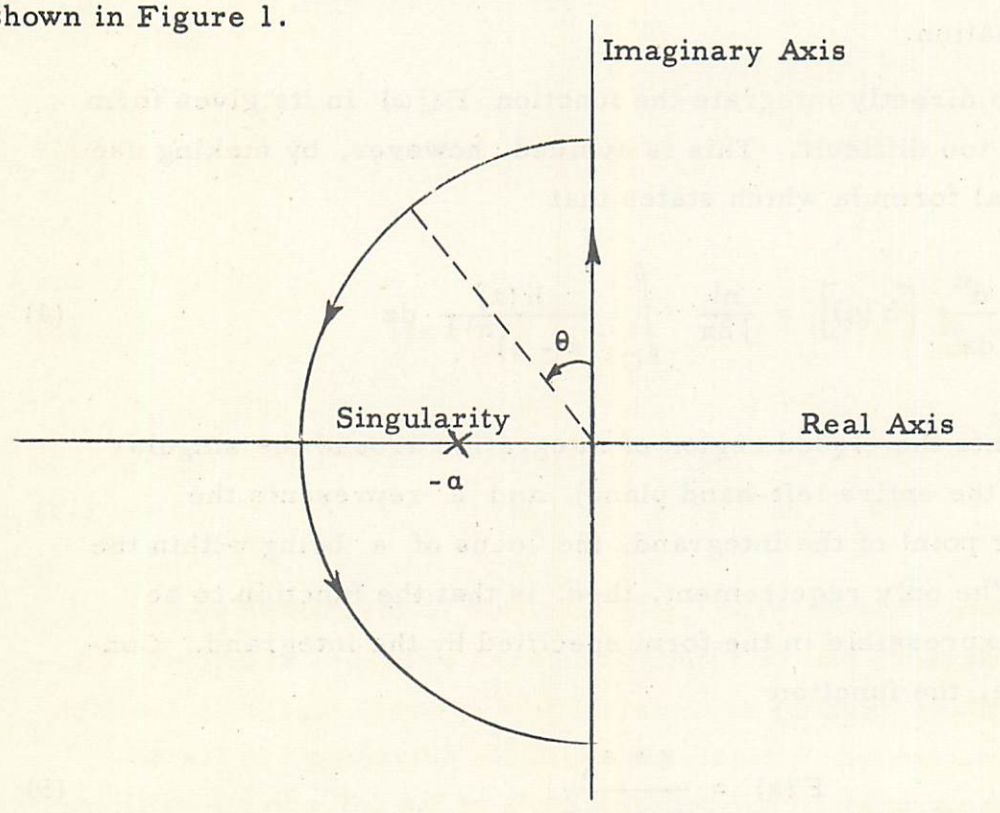

Figure 1. Contour of Integration

The first integral on the right-hand side of equation (8) corresponds to the inverse transformation of the function, as given by equation (6). The second integral on the right-hand side of equation (8) will be zero (see references 1, 3, 4, 6, 7, 8, 9) as long as the function of s obeys the restrictions mentioned previously.

Cauchy's integral equation (7) may, therefore, be rewritten as follows:

$$-\frac{d}{da}\left[h(-a)\right] = \frac{1}{j\,2\pi}\int_{-j\infty}^{+j\infty}\frac{s + a_o}{(s + a)^2}\,e^{st}\,ds \tag{9}$$

Comparing this expression with equation (6) for the inverse Laplace transformation, it is seen that

$$f(t) = -\frac{d}{da}\left[h(-a)\right] \tag{10}$$

But since

$$h(-a) = (a_o - a)\,e^{-at} \tag{11}$$

then

$$-\frac{d}{da}\left[h(-a)\right] = e^{-at} + e^{-at}(a_o - a)t \tag{12}$$

Hence

$$f(t) = e^{-at}\left[1 + (a_o - a)t\right] \tag{13}$$

The ease with which the inverse transformation is performed using Cauchy's integral suggests that this method be used whenever possible. To do so, the basic function must be expressible as a rational algebraic fraction of polynomials in the complex variable s, with the polynomial in the denominator appearing in factored form. The roots of the polynomial will, in general, include both real and complex components. Therefore, they will be written as follows:

$$(s+s_1)(s+s_2)\ldots(s+s_N)\left[(s+\alpha_1)^2+\beta_1^2\right]\left[(s+\alpha_2)^2+\beta_2^2\right]\ldots\left[(s+\alpha_M)^2+\beta_M^2\right]$$

or, in symbolic form,

$$\prod_{n=1}^{N}(s+s_n)\prod_{m=1}^{M}\left[(s+\alpha_m)^2+\beta_m^2\right]$$

where the s_n are the real roots, and the α_m and β_m represent the components of the complex conjugate roots. Because the procedure for the inverse transformation involving real roots is somewhat different from that for the complex conjugate roots, the two will be presented separately.

2. Real Roots

Once the denominator has been factored, the function is expanded into partial fractions with distinct roots, i.e., where $s_x = s_{x+i}$, of the form

$$F(s) = \frac{A(s)}{\prod_{x=1}^{N}(s+s_x)} = \frac{K_1}{s+s_1} + \frac{K_2}{s+s_2} + \ldots + \frac{K_N}{s+s_N} \tag{14}$$

where the roots, as considered in this case, are all real.

With the function $F(s)$ expressed in this form, Cauchy's integral theorem may be applied directly; it will be found that for this type of function

$$f(t) = \sum_{n=1}^{N} K_m e^{-s_n t} \tag{15}$$

where

$$K_n = \left.\frac{A(s)(s+s_n)}{\prod_{x=1}^{N}(s+s_x)}\right|_{s=s_n} \tag{16}$$

3. Complex Conjugate Roots

In this case, the function $F(s)$ takes the form

$$F(s) = \frac{A(s)}{\prod_{m=1}^{M} \left[(s + \alpha_m)^2 + \beta_m^2\right]} \tag{17}$$

which may be expanded as

$$F(s) = \frac{K_1}{s + \alpha + j\beta_1} + \frac{K_1'}{s + \alpha_1 - j\beta_1} + \frac{K_2}{s + \alpha_2 + j\beta_2} + \frac{K_2'}{s + \alpha_2 - j\beta_2} + \ldots \tag{18}$$

where the $\alpha_i \neq \alpha_x$, the $\beta_i \neq \beta_x$ and the K's are evaluated from the following relationships,

$$K_n = \left. \frac{A(s)(s + \alpha_n + j\beta_n)}{\prod_{m=1}^{M} \left[(s + \alpha_m)^2 + \beta_m^2\right]} \right|_{s=-\alpha_n - j\beta_n} \tag{19}$$

and

$$K_n' = \left. \frac{A(s)(s + \alpha_n - j\beta_n)}{\prod_{m=1}^{M} \left[(s + \alpha)^2 + \beta_m^2\right]} \right|_{s=-\alpha_n + j\beta_n} \tag{20}$$

where it can be shown (see reference 2) that K_n' is the complex conjugate of K_n. Therefore, letting

$$K_n' = X_n + j\,Y_n \tag{21}$$

the function $F(s)$ becomes

$$F(s) = \frac{X_1 - jY_1}{s + \alpha_1 + j\beta_1} + \frac{X_1 + jY_1}{s + \alpha_1 - j\beta_1} + \frac{X_2 - jY_2}{s + \alpha_2 + j\beta_2} + \ldots \tag{22}$$

Applying Cauchy's integral theorem directly,

$$f(t) = (X_1 - jY_1)\, e^{-(\alpha_1+j\beta_1)t} + (X_1 + jY_1)\, e^{-(\alpha_1-j\beta_1)t} + \ldots \tag{23}$$

or

$$f(t) = 2(X_1 \cos \beta_1 t - Y_1 \sin \beta_1 t)\, e^{-\alpha_1 t} + 2(X_2 \cos \beta_2 t - Y_2 \sin \beta_2 t)\, e^{-\alpha_2 t} + \ldots \tag{23a}$$

which may be rewritten in abbreviated form to yield

$$f(t) = \sum_{m=1}^{M} 2\sqrt{X_m^2 + Y_m^2}\; e^{-\alpha_m t} \cos\left(\beta_m t + \tan^{-1}\frac{Y_m}{X_m}\right) \tag{23b}$$

Because no conditions or restrictions were made in deriving this equation, it may, for all practical purposes, be used in the solution of any inverse transformation involving underdamped quadratic factors in the denominator of the complex function.

4. Complex Roots

This is the case in which the function $F(s)$ has the form

$$F(s) = \frac{A(s)}{(s^2 + \delta^2)\, B(s)} \tag{24}$$

which may be expanded in partial fraction form as follows:

$$F(s) = \frac{K_1}{s + j\delta} + \frac{K_2}{s - j\delta} + \text{remainder}\,(s) \tag{25}$$

where the constants K_1 and K_2 are evaluated as follows:

$$K_1 = F(s)\,(s + j\delta)\Big|_{s=-j\delta} = X - jY \tag{26}$$

$$K_2 = F(s)\,(s - j\delta)\Big|_{s=j\delta} = X + jY \tag{27}$$

By direct application of Cauchy's integral theorem,

$$f(t) = (X - jY)\, e^{-j\delta t} + (X + jY)\, e^{j\delta t} + \text{remainder } (t) \tag{28}$$

which reduces to the following form

$$f(t) = 2\sqrt{X^2 + Y^2}\, \cos\left(\delta t + \tan^{-1}\frac{Y}{X}\right) + \text{remainder } (t) \tag{28a}$$

5. Multiple Order Poles, Real Roots

For this case, the function $F(s)$ is considered to be of the form

$$F(s) = \frac{A(s)}{(s + \alpha)^r\, B(s)} \tag{29}$$

which may be expanded in partial fractions as follows:

$$F(s) = \frac{K_1}{s + \alpha} + \frac{K_2}{(s + \alpha)^2} + \ldots + \frac{K_n}{(s + \alpha)^n} + \ldots + \frac{K_r}{(s + \alpha)^r} + \text{remainder } (s) \tag{30}$$

where

$$K_n = \frac{1}{(r - n)!}\, \frac{d^{r-n}}{ds^{r-n}} \left[F(s)(s + \alpha)^r\right]\Big|_{s=-\alpha} \qquad n = 1, 2, 3, \ldots, r \tag{31}$$

From Cauchy's integral theorem, the inverse Laplace transformation of a typical term is

$$\frac{K_n t^{n-1}}{(n - 1)!}\, e^{-\alpha t}$$

Applying this general result to the above function,

$$f(t) = e^{-\alpha t} \sum_{n=1}^{r} \frac{t^{n-1}}{(n - 1)!\,(r - n)!}\, \frac{d^{r-n}}{ds^{r-n}} \left[F(s)(s + \alpha)^r\right]\Big|_{s=-\alpha} + \text{remainder } (t) \tag{32}$$

6. Multiple Order Poles, Complex Roots

The function $F(s)$ to be considered has the form

$$F(s) = \frac{A(s)}{(s^2 - \delta^2)^r B(s)} \tag{33}$$

The expansion in partial fractions yields

$$F(s) = \frac{K_{11}}{s + j\delta} + \frac{K_{21}}{(s + j\delta)^2} + \ldots + \frac{K_{n1}}{(s + j\delta)} + \ldots + \frac{K_{r1}}{(s + j\delta)^r} + \frac{K_{12}}{s - j\delta} + \frac{K_{22}}{(s - j\delta)^2}$$

$$+ \ldots + \frac{K_{n2}}{(s - j\delta)^n} + \ldots + \frac{K_{r2}}{(s - j\delta)^r} + \text{remainder } (s) \tag{34}$$

where the constants may be evaluated from the following relationships

$$(r-n)!\, K_{n2} = \frac{d^{r-n}}{ds^{r-n}} \left[F(s)(s - j\delta)^2\right]\Big|_{s=j\delta} = X_n + jY_n \tag{35}$$

$$(r-n)!\, K_{n1} = \frac{d^{r-n}}{ds^{r-n}} \left[F(s)(s + j\delta)^2\right]\Big|_{s=j\delta} = X_n - jY_n \tag{36}$$

Substituting these values in the above partial fraction expansion and performing the inverse transformation by application of Cauchy's integral equation,

$$f(t) = \sum_{n=1}^{r} \frac{t^{n-1}}{(n-1)!\,(r-n)!} \left[(X_n - jY_n)\, e^{-j\delta t} + (X_n + jY_n)\, e^{j\delta t}\right] \tag{37}$$

which may be expressed in more compact form as follows:

$$f(t) = \sum_{n=1}^{r} \frac{2t^{n-1}\sqrt{X_n^2 + Y_n^2}}{(n-1)!\,(r-n)!} \cos\left(\delta t + \tan^{-1}\frac{Y_n}{X_n}\right) + \text{remainder } (t) \tag{37a}$$

7. Multiple Order Poles, Complex Conjugate Roots

In this case, the function $F(s)$ has the form

$$F(s) = \frac{A(s)}{\left[(s+\alpha)^2 + \beta^2\right]^r B(s)} \tag{38}$$

The partial fraction expansion for this case takes the form

$$F(s) = \frac{K_{11}}{s+\alpha+j\beta} + \frac{K_{21}}{(s+\alpha+j\beta)^2} + \ldots + \frac{K_{r1}}{(s+\alpha+j\beta)^r} + \frac{K_{12}}{s+\alpha-j\beta}$$

$$+ \frac{K_{22}}{(s+\alpha-j\beta)^2} + \ldots + \frac{K_{r2}}{(s+\alpha-j\beta)^r} + \text{remainder } (s) \tag{39}$$

where the constants are defined by the following relationships:

$$(r-n)!\, K_{n2} = \frac{d^{r-n}}{ds^{r-n}} \left[F(s)(s+\alpha-j\beta)^r\right]\Big|_{s=+\alpha+j\beta} = X_n + jY_n \tag{40}$$

$$(r-n)!\, K_{n1} = \frac{d^{r-n}}{ds^{r-n}} \left[F(s)(s+\alpha-j\beta)\right]\Big|_{s=-\alpha-j\beta} = X_n - jY_n \tag{41}$$

Substituting these values in the above partial fraction expansion and performing the inverse transformation,

$$f(t) = \sum_{n=1}^{r} \frac{t^{n-1} e^{-\alpha t}}{(n-1)!\,(r-n)!} \left[(X_n - jY_n)\, e^{-j\beta t} + (X_n + jY_n)\, e^{j\beta t}\right] + \text{remainder } (t) \tag{42}$$

Expanding the term in brackets and condensing,

$$f(t) = \sum_{n=1}^{r} \frac{2t^{n-1} e^{-\alpha t}}{(n-1)!\,(r-n)!} \sqrt{X_n^2 + Y_n^2}\, \cos\left(\beta t + \tan^{-1}\frac{Y_n}{X_n}\right) + \text{remainder } (t) \tag{42a}$$

III. LAPLACE TRANSFORM TABLE

Section 1. Equations 0.1 to 0.15

$F(s)$	$f(t)$
Equation 0.1 $\lim_{T\to\infty}\int_0^T f(t)e^{-st}dt$	$f(t)$
Equation 0.2 $aF(s)$	$af(t)$
Equation 0.3 $s^nF(s)-s^{n-1}f(0+)-s^{n-2}\frac{d}{dt}f(0+)$ $-\cdots\cdots-s\frac{d^{n-2}}{dt^{n-2}}f(0+)-\frac{d^{n-1}}{dt^{n-1}}f(0+)$	$\frac{d^n}{dt^n}f(t)$
Equation 0.4 $-\frac{d}{ds}F(s)$	$tf(t)$
Equation 0.5 $\int_s^\infty F(s)ds$	$\frac{1}{t}f(t)$
Equation 0.6 $\frac{1}{s}F(s)+\frac{1}{s}f^{(-1)}(0+)$	$\int f(t)\,dt = f^{(-1)}(t)$
Equation 0.7 $\frac{1}{s}F(s)$	$\int_0^t f(t)dt$
Equation 0.8 $aF(as)$	$f\left(\frac{t}{a}\right)$ a = constant
Equation 0.9 $\int_{a_0}^{a} F(s,a)\,da$	$\int_{a_0}^{a} f(t,a)\,da$ $a\neq a(t)$ $a\neq a(s)$

$F(s)$	$f(t)$
Equation 0.10	
$F(s \mp \nu)$	$e^{\pm \nu t} f(t)$ ν = complex number with positive real pa
Equation 0.11	
$\lim_{s \to 0} sF(s)$	$\lim_{t \to \infty} f(t)$
Equation 0.12	
$\lim_{s \to \infty} sF(s)$	$\lim_{t \to 0} f(t)$
Equation 0.13 $\sum_{l=1}^{q} \left[\frac{A_1(s)}{\frac{d}{ds} B_1(s)} \right]_{s=s_l} \left[F_2(s) \right]_{s=s-s_l}$ where $F_1(s) \left(= \frac{A_1(s)}{B_1(s)} \right)$ is expressible as a rational algebraic fraction having only first order poles, and the s_l are the roots of $B_1(s)$	$f_1(t) f_2(t)$
Equation 0.14 $\sum_{l=1}^{n} \sum_{j=1}^{m_l} \frac{(-1)^{m_l - j} K_{lj}}{(m_l - j)!} \left[\frac{d^{m_l - j}}{ds^{m_l - j}} F_2(s) \right]_{s=s-s_l}$ $K_{lj} = \frac{1}{(j-1)!} \left[\frac{d^{j-1}}{ds^{j-1}} (s - s_l)^{m_l} F_1(s) \right]_{s=s_l}$ where $F_1(s)$ is expressible as a rational algebraic fraction having multiple order poles, and the s_l are as defined in 0.13	$f_1(t) f_2(t)$

F(s)	f(t)
Equation 0.15	
1	$U_1(t) = \lim_{a \to 0} \frac{U(t) - U(t-a)}{a}$ $U_1(t)$ is the unit impulse function at $t=0$ defined so that: $1 = \int_{-\infty}^{\infty} U_1(t)\, dt$

Section 2. Equations 1.1 and 1.2

F(s)	f(t)
Equation 1.1 $\frac{a_0}{s}$	$a_0 u(t)$ (unit step at t=0, with amplitude a_0)
Equation 1.2 $\frac{a_0}{s+\gamma}$	$a_0 e^{-\gamma t}$

Section 3. Equations 2.1 to 2.6

F(s)	f(t)
Equation 2.1 $\frac{a_1 s + a_0}{s^2}$	$a_0 t + a_1$
Equation 2.2 $\frac{a_1 s + a_0}{s(s+\gamma)}$	$\frac{1}{\gamma}\left[a_0 - (a_0 - a_1\gamma)\, e^{-\gamma t} \right]$
Equation 2.3 $\frac{a_1 s + a_0}{(s+\gamma)(s+\delta)}$	$\frac{1}{\delta - \gamma}\left[(a_0 - a_1\gamma)\, e^{-\gamma t} - (a_0 - a_1\delta)\, e^{-\delta t} \right]$
Equation 2.4 $\frac{a_1 s + a_0}{(s+\gamma)^2}$	$\left[(a_0 - a_1\gamma)t + a_1 \right] e^{-\gamma t}$
Equation 2.5 $\frac{a_1 s + a_0}{s^2 + \lambda^2}$	$\frac{1}{\lambda}\sqrt{a_0^2 + a_1^2 \lambda^2}\ \cos(\lambda t - \psi)$ $\qquad \psi = \text{TAN}^{-1}\ \frac{a_0}{a_1 \lambda}$
Equation 2.6 $\frac{a_1 s + a_0}{(s+\alpha)^2 + \beta^2}$	$\frac{1}{\beta}\sqrt{(a_0 - a_1\alpha)^2 + a_1^2 \beta^2}\ e^{-\alpha t} \cos(\beta t - \psi)$ $\qquad \psi = \text{TAN}^{-1}\ \frac{a_0 - a_1\alpha}{a_1 \beta}$

Section 4. Equations 3.1 to 3.9

F(s)	f(t)
Equation 3.1 $\frac{N_2(s)}{s^2(s+\gamma)}$	$\frac{1}{\gamma}(a_0 t + a_1) - \frac{1}{\gamma^2}\left[a_0 - (a_0 - a_1\gamma + a_2\gamma^2)\, e^{-\gamma t}\right]$
Equation 3.2 $\frac{N_2(s)}{s(s+\gamma)(s+\delta)}$	$\frac{a_0}{\gamma\delta} + \frac{1}{\gamma\delta(\gamma-\delta)}\left[(a_0 - a_1\gamma + a_2\gamma^2)\delta e^{-\gamma t} - (a_0 - a_1\delta + a_2\delta^2)\gamma\, e^{-\delta t}\right]$
Equation 3.3 $\frac{N_2(s)}{s(s+\gamma)^2}$	$\frac{a_0}{\gamma^2} - \frac{1}{\gamma^2}\left[(a_0 - a_1\gamma + a_2\gamma^2)\gamma t + (a_0 - a_2\gamma^2)\right] e^{-\gamma t}$
Equation 3.4 $\frac{N_2(s)}{s(s^2+\lambda^2)}$	$\frac{a_0}{\lambda^2} - \frac{1}{\lambda^2}\sqrt{(a_0 - a_2\lambda^2)^2 + a_1^2\lambda^2}\,\cos(\lambda t + \psi)$ $\qquad \psi = \text{TAN}^{-1}\frac{a_1\lambda}{a_0 - a_2\lambda^2}$
Equation 3.5 $\frac{N_2(s)}{s[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\alpha^2+\beta^2} - \frac{1}{\beta}\sqrt{\frac{(1)^2 + (2)^2}{\alpha^2 + \beta^2}}\, e^{-\alpha t}\cos(\beta t + \psi)$ $\qquad \psi = \text{TAN}^{-1}\frac{(2)}{(1)} - \text{TAN}^{-1}\frac{\alpha}{\beta}$
Equation 3.6 $\frac{N_2(s)}{(s+\gamma)(s+\delta)(s+\mu)}$	$\frac{a_0 - a_1\gamma + a_2\gamma^2}{(\delta-\gamma)(\mu-\gamma)} e^{-\gamma t} + \frac{a_0 - a_1\delta + a_2\delta^2}{(\gamma-\delta)(\mu-\delta)} e^{-\delta t} + \frac{a_0 - a_1\mu + a_2\mu^2}{(\gamma-\mu)(\delta-\mu)} e^{-\mu t}$
Equation 3.7 $\frac{N_2(s)}{(s+\gamma)(s+\delta)^2}$	$\frac{a_0 - a_1\gamma + a_2\gamma^2}{(\delta-\gamma)^2} e^{-\gamma t} + \left[\frac{a_0 - a_1\delta + a_2\delta^2}{\gamma-\delta} t - \frac{a_0 - a_1\gamma + a_2\delta(2\gamma-\delta)}{(\gamma-\delta)^2}\right] e^{-\delta t}$

F(s)	f(t)
Equation 3.8 $\frac{N_2(s)}{(s+\gamma)(s^2+\lambda^2)}$	$\frac{a_0 - a_1\gamma + a_2\gamma^2}{\gamma^2+\lambda^2} e^{-\gamma t} + \frac{1}{\lambda}\sqrt{\frac{(a_0 - a_2\lambda^2)^2 + a_1^2\lambda^2}{\gamma^2+\lambda^2}} \cos(\lambda t - \psi)$ $\psi = \text{TAN}^{-1}\frac{a_0 - a_2\lambda^2}{a_1\lambda} + \text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 3.9 $\frac{N_2(s)}{(s+\gamma)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0 - a_1\gamma + a_2\gamma^2}{(\alpha-\gamma)^2+\beta^2} e^{-\gamma t} + \frac{1}{\beta}\sqrt{\frac{(1)^2 + (2)^2}{(\alpha-\gamma)^2+\beta^2}} e^{-\alpha t}\cos(\beta t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(1)}{(2)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$

ABBREVIATIONS

$N_2(s) = a_2 s^2 + a_1 s + a_0$

(1) $= R N_2(s)\big|_{s=-\alpha+j\beta}$ (2) $= I N_2(s)\big|_{s=-\alpha+j\beta}$

Section 5. Equations 4.1 to 4.20

F(s)	f(t)
Equation 4.1 $\frac{N_3(s)}{s^2(s+\gamma)(s+\delta)}$	$\frac{a_0}{\gamma\delta}t - \frac{a_0(\gamma+\delta)-a_1\gamma\delta}{\gamma^2\delta^2} + \frac{(1)}{\gamma^2(\delta-\gamma)}e^{-\gamma t} + \frac{(2)}{\delta^2(\gamma-\delta)}e^{-\delta t}$
Equation 4.2 $\frac{N_3(s)}{s^2(s+\gamma)^2}$	$\frac{a_0}{\gamma^2}t - \frac{2a_0-a_1\gamma}{\gamma^3} + \frac{1}{\gamma^2}\left[(1)t + \frac{2a_0-a_1\gamma+a_3\gamma^3}{\gamma}\right]e^{-\gamma t}$
Equation 4.3 $\frac{N_3(s)}{s^2(s^2+\lambda^2)}$	$\frac{a_0}{\lambda^2}t + \frac{a_1}{\lambda^2} - \frac{1}{\lambda^3}\sqrt{(5)^2+(6)^2}\cos(\lambda t-\psi)$ $\qquad \psi = \text{TAN}^{-1}\frac{(5)}{(6)}$
Equation 4.4 $\frac{N_3(s)}{s^2[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{A^2}t - \frac{2a_0\alpha-a_1A^2}{A^4} + \frac{1}{\beta A^2}\sqrt{(9)^2+(10)^2}\,e^{-\alpha t}\cos(\beta t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(10)}{(9)} - \text{TAN}^{-1}\frac{\alpha}{\beta} + \text{TAN}^{-1}\frac{\beta}{\alpha}$
Equation 4.5 $\frac{N_3(s)}{s(s+\gamma)(s+\delta)(s+\mu)}$	$\frac{a_0}{\gamma\delta\mu} - \frac{(1)}{\gamma(\delta-\gamma)(\mu-\gamma)}e^{-\gamma t} - \frac{(2)}{\delta(\gamma-\delta)(\mu-\delta)}e^{-\delta t} - \frac{(3)}{\mu(\gamma-\mu)(\delta-\mu)}e^{-\mu t}$
Equation 4.6 $\frac{N_3(s)}{s(s+\gamma)(s+\delta)^2}$	$\frac{a_0}{\gamma\delta^2} - \frac{(1)}{\gamma(\delta-\gamma)^2}e^{-\gamma t} - \left[\frac{(2)}{\delta(\gamma-\delta)}t + \frac{a_0(\gamma-2\delta)+a_1\delta^2-a_2\gamma\delta^2+a_3\delta^3(2\gamma-\delta)}{\delta^2(\gamma-\delta)^2}\right]e^{-\delta t}$
Equation 4.7 $\frac{N_3(s)}{s(s+\gamma)(s^2+\lambda^2)}$	$\frac{a_0}{\gamma\lambda^2} - \frac{(1)}{\gamma(\gamma^2+\lambda^2)}e^{-\gamma t} - \frac{1}{\lambda^2}\sqrt{\frac{(5)^2+(6)^2}{\gamma^2+\lambda^2}}\cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(5)} - \text{TAN}^{-1}\frac{\lambda}{\gamma}$

F(s)	f(t)
Equation 4.8 $\frac{N_3(s)}{s(s+\gamma)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma A^2} - \frac{(1)}{\gamma[(\alpha-\gamma)^2+\beta^2]} e^{-\gamma t} - \frac{1}{\beta A}\sqrt{\frac{(9)^2+(10)^2}{(\gamma-\alpha)^2+\beta^2}}\, e^{-\alpha t}\cos(\beta t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(10)}{(9)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 4.9 $\frac{N_3(s)}{(s+\gamma)(s+\delta)(s+\mu)(s+\eta)}$	$\frac{(1)}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)} e^{-\gamma t} + \frac{(2)}{(\gamma-\delta)(\mu-\delta)(\eta-\delta)} e^{-\delta t} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\eta-\mu)} + \frac{(4)e^{-\eta t}}{(\gamma-\eta)(\delta-\eta)(\mu-$
Equation 4.10 $\frac{N_3(s)}{(s+\gamma)(s+\delta)(s+\mu)^2}$	$\frac{(1)}{(\delta-\gamma)(\mu-\gamma)^2} e^{-\gamma t} + \frac{(2)}{(\gamma-\delta)(\mu-\delta)^2} e^{-\delta t} + \frac{(3)}{(\gamma-\mu)(\delta-\mu)} t\, e^{-\mu t}$ $+ \frac{a_0(2\mu-\gamma-\delta)+a_1(\gamma\delta-\mu^2)+a_2\mu[\mu(\gamma+\delta)-2\gamma\delta]+a_3\mu^2[\mu^2-2\mu(\gamma+\delta)+3\gamma\delta}{(\gamma-\mu)^2(\delta-\mu)^2}$
Equation 4.11 $\frac{N_3(s)}{(s+\gamma)(s+\delta)(s^2+\lambda^2)}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\gamma^2+\lambda^2)} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\delta^2+\lambda^2)} - \frac{1}{\lambda}\sqrt{\frac{(5)^2+(6)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}}\cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(5)} + \text{TAN}^{-1}\frac{\delta}{\lambda} - \text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 4.12 $\frac{N_3(s)}{(s+\gamma)(s+\delta)[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)[(\alpha-\delta)^2+\beta^2]}$ $+ \frac{1}{\beta}\sqrt{\frac{(9)^2+(10)^2}{[(\delta-\alpha)^2+\beta^2][(\gamma-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(9)}{(10)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha}$

F(s)	f(t)
Equation 4.13 $\frac{N_3(s)}{(s+\gamma)^2(s+\delta)^2}$	$\left[\frac{(1)}{(\delta-\gamma)^2}t - \frac{2a_0 - a_1(\gamma+\delta) + 2a_2\gamma\delta - a_3\gamma^2(3\delta-\gamma)}{(\delta-\gamma)^3}\right]e^{-\gamma t}$ $+\left[\frac{(2)}{(\gamma-\delta)^2}t - \frac{2a_0 - a_1(\gamma+\delta) + 2a_2\gamma\delta - a_3\delta^2(3\gamma-\delta)}{(\gamma-\delta)^3}\right]e^{-\delta t}$
Equation 4.14 $\frac{N_3(s)}{(s+\gamma)^2(s^2+\lambda^2)}$	$\left[\frac{(1)}{\gamma^2+\lambda^2}t + \frac{2a_0\gamma + a_1(\lambda^2-\gamma^2) - 2a_2\lambda^2\gamma + a_3\gamma^2(\gamma^2+3\lambda^2)}{(\gamma^2+\lambda^2)^2}\right]e^{-\gamma t}$ $-\frac{1}{\lambda(\gamma^2+\lambda^2)}\sqrt{(5)^2+(6)^2}\cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(5)} + \text{TAN}^{-1}\frac{\gamma}{\lambda} - \text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 4.15 $\frac{N_3(s)}{(s+\gamma)^2[(s+\alpha)^2+\beta^2]}$	$\left[\frac{(1)}{(\alpha-\gamma)^2+\beta^2} + \frac{2a_0(\gamma-\alpha) + a_1(A^2-\gamma^2) - 2a_2\gamma(A^2-\alpha\gamma) + a_3\gamma^2(\gamma^2-4\alpha\gamma+3A^2)}{[(\alpha-\gamma)^2+\beta^2]^2}\right]e^{-\gamma t}$ $+\frac{1}{\beta[(\gamma-\alpha)^2+\beta^2]}\sqrt{(9)^2+(10)^2}\,e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(9)}{(10)} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 4.16 $\frac{N_3(s)}{(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{\sqrt{(5)^2+(6)^2}}{\lambda(\epsilon^2-\lambda^2)}\cos(\lambda t-\psi_1) + \frac{\sqrt{(7)^2+(8)^2}}{\epsilon(\lambda^2-\epsilon^2)}\cos(\epsilon t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(5)}{(6)} \qquad \psi_2 = \text{TAN}^{-1}\frac{(7)}{(8)}$

F(s)	f(t)
Equation 4.17 $\frac{N_3(s)}{(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{1}{\lambda}\sqrt{\frac{(5)^2+(6)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t-\psi_1)+\frac{1}{\beta}\sqrt{\frac{(9)^2+(10)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}e^{-\alpha t}\cos(\beta t$ $\psi_1=\text{TAN}^{-1}\frac{(5)}{(6)}+\text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}\qquad\psi_2=\text{TAN}^{-1}\frac{(9)}{(10)}-\text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+}$
Equation 4.18 $\frac{N_3(s)}{[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{1}{\beta}\sqrt{\frac{(9)^2+(10)^2}{\{[(\sigma-\alpha)^2+\beta^2]-\tau^2\}^2+4\tau^2(\sigma-\alpha)^2}}e^{-\alpha t}\cos(\beta t-\psi_1)$ $+\frac{1}{\tau}\sqrt{\frac{(11)^2+(12)^2}{\{[(\sigma-\alpha)^2+\beta^2]-\tau^2\}^2+4\tau^2(\sigma-\alpha)^2}}e^{-\sigma t}\cos(\tau t-\psi_2)$ $\psi_1=\text{TAN}^{-1}\frac{(9)}{(10)}+\text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}\qquad\psi_2=\text{TAN}^{-1}\frac{(11)}{(12)}+\text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\sigma-\alpha)^2-\tau^2+\beta}$
Equation 4.19 $\frac{N_3(s)}{(s^2+\lambda^2)^2}$	$-\frac{1}{2\lambda^2}\sqrt{(5)^2+(6)^2}\;t\cos(\lambda t+\psi_1)+\frac{1}{2\lambda^3}\sqrt{4a_3^2\lambda^6+(a_0+a_2\lambda^2)^2}\cos(\lambda t-\psi$ $\psi_1=\text{TAN}^{-1}\frac{(6)}{(5)}\qquad\psi_2=\text{TAN}^{-1}\frac{a_0+a_2\lambda^2}{2a_3\lambda^3}$
Equation 4.20 $\frac{N_3(s)}{[(s+\alpha)^2+\beta^2]^2}$	$-\frac{1}{2\beta^2}\sqrt{(9)^2+(10)^2}\;t\,e^{-\alpha t}\cos(\beta t+\psi_1)$ $+\frac{1}{2\beta^3}\sqrt{4a_3^2\beta^6+[a_0-a_1\alpha+a_2A^2-a_3\alpha(A^2+2\beta^2)]^2}\;e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1=\text{TAN}^{-1}\frac{(10)}{(9)}\qquad\psi_2=\text{TAN}^{-1}\frac{a_0-a_1\alpha+a_2A^2-a_3\alpha(A^2+2\beta^2)}{2a_3\beta^3}$

ABBREVIATIONS

$N_3(s) = a_3 s^3 + a_2 s^2 + a_1 s + a_0$

$A^2 = \alpha^2 + \beta^2$

(1) = $N_3(s)\Big|_{s=-\gamma}$

(2) = $N_3(s)\Big|_{s=-\delta}$

(3) = $N_3(s)\Big|_{s=-\mu}$

(4) = $N_3(s)\Big|_{s=-\eta}$

(5) = R $N_3(s)\Big|_{s=j\lambda}$

(6) = I $N_3(s)\Big|_{s=j\lambda}$

(7) = R $N_3(s)\Big|_{s=j\epsilon}$

(8) = I $N_3(s)\Big|_{s=j\epsilon}$

(9) = R $N_3(s)\Big|_{s=-\alpha+j\beta}$

(10) = I $N_3(s)\Big|_{s=-\alpha+j\beta}$

(11) = R $N_3(s)\Big|_{s=-\sigma+j\tau}$

(12) = I $N_3(s)\Big|_{s=-\sigma+j\tau}$

Section 6. Equations 5.1 to 5.28

F(s)	f(t)
Equation 5.1 $\frac{N_4(s)}{s^2(s+\gamma)(s+\delta)(s+\mu)}$	$\frac{a_0 t + a_1}{\gamma\delta\mu} - \frac{a_0(\gamma\delta+\gamma\mu+\delta\mu)}{\gamma^2\delta^2\mu^2} + \frac{(1)e^{-\gamma t}}{\gamma^2(\delta-\gamma)(\mu-\gamma)} + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)(\mu-\delta)} + \frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)(\delta-\mu)}$
Equation 5.2 $\frac{N_4(s)}{s^2(s+\gamma)^2(s+\delta)}$	$\frac{a_0 t + a_1}{\gamma^2\delta} - \frac{a_0(\gamma+2\delta)}{\gamma^3\delta^2} + \left[\frac{(1)t+(14)}{\gamma^2(\delta-\gamma)} + \frac{(2\delta-3\gamma)(1)}{\gamma^3(\delta-\gamma)^2}\right]e^{-\gamma t} + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)^2}$
Equation 5.3 $\frac{N_4(s)}{s^2(s+\gamma)(s^2+\lambda^2)}$	$\frac{a_0 t + a_1}{\gamma\lambda^2} - \frac{a_0}{\gamma^2\lambda^2} + \frac{(1)e^{-\gamma t}}{\gamma^2(\gamma^2+\lambda^2)} - \frac{1}{\lambda^3}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\cos(\lambda t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 5.4 $\frac{N_4(s)}{s^2(s+\gamma)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0 t + a_1}{\gamma A^2} - \frac{a_0(A^2+2\alpha\gamma)}{\gamma^2 A^4} + \frac{(1)e^{-\gamma t}}{\gamma^2[(\alpha-\gamma)^2+\beta^2]} + \frac{1}{\beta A^2}\sqrt{\frac{(10)^2+(11)^2}{(\alpha-\gamma)^2+\beta^2}}\,e^{-\alpha t}\cos(\beta t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(10)}{(11)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha}$
Equation 5.5 $\frac{N_4(s)}{s(s+\gamma)(s+\delta)(s+\mu)(s+\eta)}$	$\frac{a_0}{\gamma\delta\mu\eta} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\mu-\delta)(\eta-\delta)} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)(\delta-\mu)(\eta-\mu)} - \frac{(4)e^{-\eta t}}{\eta(\gamma-\eta)(\delta-\eta)(\mu-\eta)}$

F(s)	f(t)
Equation 5.6 $\frac{N_4(s)}{s(s+\gamma)^2(s+\delta)(s+\mu)}$	$\frac{a_0}{\gamma^2\delta\mu} - \left[\frac{(1)t+(14)}{\gamma(\mu-\gamma)(\delta-\gamma)} + \frac{[(\delta-\gamma)(\mu-\gamma)-\gamma(\delta-\gamma)-\gamma(\mu-\gamma)](1)}{\gamma^2(\delta-\gamma)^2(\mu-\gamma)^2}\right] e^{-\gamma t}$ $- \frac{(3)e^{-\mu t}}{\mu(\delta-\mu)(\gamma-\mu)^2} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)^2(\mu-\delta)}$
Equation 5.7 $\frac{N_4(s)}{s(s+\gamma)(s+\delta)(s^2+\lambda^2)}$	$\frac{a_0}{\gamma\delta\lambda^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\gamma^2+\lambda^2)} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\delta^2+\lambda^2)} - \frac{1}{\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}}\cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\delta} - \text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 5.8 $\frac{N_4(s)}{s(s+\gamma)(s+\delta)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma\delta A^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)[(\alpha-\delta)^2+\beta^2]}$ $- \frac{1}{\beta A}\sqrt{\frac{(10)^2+(11)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(11)}{(10)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{\beta}{\delta-\alpha}$
Equation 5.9 $\frac{N_4(s)}{s(s+\gamma)^2(s+\delta)^2}$	$\frac{a_0}{\gamma^2\delta^2} - \left[\frac{(1)t+(14)}{\gamma(\delta-\gamma)^2} + \frac{[(\delta-\gamma)-2\gamma](1)}{\gamma^2(\delta-\gamma)^3}\right] e^{-\gamma t}$ $- \left[\frac{(2)t+(15)}{\delta(\gamma-\delta)^2} + \frac{[(\gamma-\delta)-2\delta](2)}{\delta^2(\gamma-\delta)^3}\right] e^{-\delta t}$

F(s)	f(t)
Equation 5.10 $\frac{N_4(s)}{s(s+\gamma)^2(s^2+\lambda^2)}$	$\frac{a_0}{\gamma^2\lambda^2} - \left[\frac{(1)t+(14)}{\gamma(\gamma^2+\lambda^2)} + \frac{[(\gamma^2+\lambda^2)+2\gamma^2](1)}{\gamma^2(\gamma^2+\lambda^2)^2}\right] e^{-\gamma t} - \frac{\sqrt{(6)^2+(7)^2}}{\lambda^2(\gamma^2+\lambda^2)} \cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(7)}{(6)} - 2\ \text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 5.11 $\frac{N_4(s)}{s(s+\gamma)^2[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma^2A^2} - \left[\frac{(1)t+(14)}{\gamma[(\alpha-\gamma)^2+\beta^2]} + \frac{[(\alpha-\gamma)^2+\beta^2-2\gamma(\alpha-\gamma)](1)}{\gamma^2[(\alpha-\gamma)^2+\beta^2]^2}\right] e^{-\gamma t}$ $- \frac{\sqrt{(10)^2+(11)^2}}{\beta A[(\gamma-\alpha)^2+\beta^2]} e^{-\alpha t}\cos(\beta t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(11)}{(10)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - 2\ \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 5.12 $\frac{N_4(s)}{s(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{a_0}{\lambda^2\epsilon^2} - \frac{\sqrt{(6)^2+(7)^2}}{\lambda^2(\epsilon^2-\lambda^2)}\cos(\lambda t+\psi_1) - \frac{\sqrt{(8)^2+(9)^2}}{\epsilon^2(\lambda^2-\epsilon^2)}\cos(\epsilon t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} \qquad \psi_2 = \text{TAN}^{-1}\frac{(9)}{(8)}$
Equation 5.13 $\frac{N_4(s)}{s(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\lambda^2A^2} - \frac{1}{\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t+\psi_1) - \frac{1}{\beta A}\sqrt{\frac{(10)^2+(11)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\, e^{-\alpha t}\cos(\beta t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(10)}{(11)} + \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\alpha^2-\beta^2+\lambda^2}{2\alpha\beta}$

F(s)	f(t)
Equation 5.14 $\frac{N_4(s)}{s[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{a_0}{A^2B^2} - \frac{1}{\beta A}\sqrt{\frac{(10)^2+(11)^2}{[(\sigma-\alpha)^2+\beta^2-\tau^2]^2+4\tau^2(\sigma-\alpha)^2}}\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $-\frac{1}{\tau B}\sqrt{\frac{(12)^2+(13)^2}{[(\sigma-\alpha)^2+\beta^2-\tau^2]^2+4\tau^2(\sigma-\alpha)^2}}\, e^{-\sigma t}\cos(\tau t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(11)}{(10)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\sigma}{\tau} - \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\sigma-\alpha)^2+\beta^2-\tau^2}$
Equation 5.15 $\frac{N_4(s)}{s(s^2+\lambda^2)^2}$	$\frac{a_0}{\lambda^4} - \frac{1}{2\lambda^3}\sqrt{(6)^2+(7)^2}\; t\cos(\lambda t-\psi_1) - \frac{1}{2\lambda^4}\sqrt{[2(6)+\lambda(17)]^2+[2(7)-\lambda(16)]^2}\cos(\lambda t+$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)}$ $\psi_2 = \text{TAN}^{-1}\frac{2(7)-\lambda(16)}{2(6)+\lambda(17)}$
Equation 5.16 $\frac{N_4(s)}{s[(s+\alpha)^2+\beta^2]^2}$	$\frac{a_0}{A^4} + \frac{1}{2\beta^2 A}\sqrt{(10)^2+(11)^2}\; t\, e^{-\alpha t}\cos(\beta t+\psi_1) + \frac{1}{2\beta^3A^2}\sqrt{(20)^2+(21)^2}\; e^{-\alpha t}\cos(\beta t+\psi_2$ $\psi_1 = \text{TAN}^{-1}\frac{(11)}{(10)} + \text{TAN}^{-1}\frac{\beta}{\alpha}$ $\psi_2 = 2\text{TAN}^{-1}\frac{\beta}{\alpha} - \text{TAN}^{-1}\frac{(20)}{(21)}$
Equation 5.17 $\frac{N_4(s)}{(s+\gamma)(s+\delta)(s+\mu)(s+\eta)(s+\rho)}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\eta-\delta)(\rho-\delta)} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\eta-\mu)(\rho-\mu)}$ $+\frac{(4)e^{-\eta t}}{(\gamma-\eta)(\delta-\eta)(\mu-\eta)(\rho-\eta)} + \frac{(5)e^{-\rho t}}{(\gamma-\rho)(\delta-\rho)(\mu-\rho)(\eta-\rho)}$

F(s)	f(t)
Equation 5.18 $\frac{N_4(s)}{(s+\gamma)^2(s+\delta)(s+\mu)(s+\eta)}$	$\left[\frac{(1)t+(14)}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)} - \frac{[(\delta-\gamma)(\mu-\gamma)+(\delta-\gamma)(\eta-\gamma)+(\mu-\gamma)(\eta-\gamma)](1)}{(\delta-\gamma)^2(\mu-\gamma)^2(\eta-\gamma)^2}\right] e^{-\gamma t}$ $+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)(\eta-\mu)} + \frac{(4)e^{-\eta t}}{(\gamma-\eta)^2(\delta-\eta)(\mu-\eta)}$
Equation 5.19 $\frac{N_4(s)}{(s+\gamma)(s+\delta)(s+\mu)(s^2+\lambda^2)}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\delta^2+\lambda^2)} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\mu^2+\lambda^2)}$ $+\frac{1}{\lambda}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)}}\cos(\lambda t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{\lambda}{\delta} + \text{TAN}^{-1}\frac{\lambda}{\mu}$
Equation 5.20 $\frac{N_4(s)}{(s+\gamma)(s+\delta)(s+\mu)[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2]} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)[(\alpha-\delta)^2+\beta^2]} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)[(\alpha-\mu)^2+\beta^2]}$ $+\frac{1}{\beta}\sqrt{\frac{(10)^2+(11)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(10)}{(11)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} + \text{TAN}^{-1}\frac{\beta}{\mu-\alpha}$
Equation 5.21 $\frac{N_4(s)}{(s+\gamma)^2(s+\delta)^2(s+\mu)}$	$\left[\frac{(1)t+(14)}{(\delta-\gamma)^2(\mu-\gamma)} - \frac{(1)[(\delta-\gamma)+2(\mu-\gamma)]}{(\delta-\gamma)^3(\mu-\gamma)^2}\right] e^{-\gamma t}$ $+\left[\frac{(2)t+(15)}{(\gamma-\delta)^2(\mu-\delta)} - \frac{(2)[(\gamma-\delta)+2(\mu-\delta)]}{(\gamma-\delta)^3(\mu-\delta)^2}\right] e^{-\delta t} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)^2}$

F(s)	f(t)
Equation 5.22 $\frac{N_4(s)}{(s+\gamma)^2(s+\delta)(s^2+\lambda^2)}$	$\left[\frac{(1)t+(14)}{(\delta-\gamma)(\gamma^2+\lambda^2)} - \frac{(1)[(\gamma^2+\lambda^2)-2\gamma(\delta-\gamma)]}{(\delta-\gamma)^2(\gamma^2+\lambda^2)^2}\right] e^{-\gamma t} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\delta^2+\lambda^2)}$ $+ \frac{1}{\lambda(\gamma^2+\lambda^2)} \sqrt{\frac{(6)^2+(7)^2}{\delta^2+\lambda^2}} \cos(\lambda t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\delta} + 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 5.23 $\frac{N_4(s)}{(s+\gamma)^2(s+\delta)[(s+\alpha)^2+\beta^2]}$	$\left[\frac{(1)t+(14)}{(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]} - \frac{(1)\{[(\alpha-\gamma)^2+\beta^2]+2(\delta-\gamma)(\alpha-\gamma)\}}{(\delta-\gamma)^2[(\alpha-\gamma)^2+\beta^2]^2}\right] e^{-\gamma t} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)^2[(\alpha-\delta)^2+\beta^2]}$ $+ \frac{1}{\beta[(\gamma-\alpha)^2+\beta^2]} \sqrt{\frac{(10)^2+(11)^2}{(\delta-\alpha)^2+\beta^2}}\, e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(10)}{(11)} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 5.24 $\frac{N_4(s)}{(s+\gamma)(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)} + \frac{1}{\lambda(\epsilon^2-\lambda^2)} \sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}} \cos(\lambda t-\psi_1)$ $+ \frac{1}{\epsilon(\lambda^2-\epsilon^2)} \sqrt{\frac{(8)^2+(9)^2}{\gamma^2+\epsilon^2}} \cos(\epsilon t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} \qquad \psi_2 = \text{TAN}^{-1}\frac{(8)}{(9)} + \text{TAN}^{-1}\frac{\epsilon}{\gamma}$

F(s)	f(t)
Equation 5.25 $\frac{N_4(s)}{(s+\gamma)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]} + \frac{1}{\lambda}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $+\frac{1}{\beta}\sqrt{\frac{(10)^2+(11)^2}{[(\gamma-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\quad \psi_2 = \text{TAN}^{-1}\frac{(10)}{(11)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$
Equation 5.26 $\frac{N_4(s)}{(s+\gamma)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{(1)e^{-\gamma t}}{[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]} + \frac{1}{\beta}\sqrt{\frac{(10)^2+(11)^2}{[(\gamma-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2+\beta^2-\tau^2]^2+4\alpha^2\tau^2}}e^{-\alpha t}\cos(\beta t-\psi_1)$ $+\frac{1}{\tau}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\sigma)^2+\tau^2]\{[(\sigma-\alpha)^2+\beta^2-\tau^2]^2+4\alpha^2\tau^2}}e^{-\sigma t}\cos(\tau t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(10)}{(11)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\tau}{\gamma-\sigma} + \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\sigma-\alpha)^2+\beta^2-\tau^2}$
Equation 5.27 $\frac{N_4(s)}{(s+\gamma)(s^2+\lambda^2)^2}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)^2} - \frac{1}{2\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\,t\cos(\lambda t+\psi_1)$ $+\frac{1}{2\lambda^3(\gamma^2+\lambda^2)}\sqrt{(22)^2+(23)^2}\cos(\lambda t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\gamma}$ $\quad \psi_2 = \text{TAN}^{-1}\frac{(23)}{(22)} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$

F(s)	f(t)
Equation 5.28 $\frac{N_4(s)}{(s+\gamma)[(s+\alpha)^2+\beta^2]^2}$	$\frac{(1)e^{-\gamma t}}{(\alpha-\gamma)^2+\beta^2} - \frac{1}{2\beta^2}\sqrt{\frac{(10)^2+(11)^2}{(\gamma-\alpha)^2+\beta^2}}\; t\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $+\frac{1}{2\beta^3[(\gamma-\alpha)^2+\beta^2]}\sqrt{(24)^2+(25)^2}\; e^{-\alpha t}\cos(\beta t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(11)}{(10)} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} \qquad \psi_2 = \text{TAN}^{-1}\frac{(25)}{(24)} - 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$

ABBREVIATIONS

$N_4(s) = a_4 s^4 + a_3 s^3 + a_2 s^2 + a_1 s + a_0$ $\qquad N_4'(s) = 4a_4 s^3 + 3a_3 s^2 + 2a_2 s + a_1$

$A^2 = \alpha^2 + \beta^2$ $\qquad B^2 = \sigma^2 + \tau^2$

(1) $= N_4(s)\Big|_{s=-\gamma}$ $\qquad$ (2) $= N_4(s)\Big|_{s=-\delta}$

(3) $= N_4(s)\Big|_{s=-\mu}$ $\qquad$ (4) $= N_4(s)\Big|_{s=-\eta}$

(5) $= N_4(s)\Big|_{s=-\rho}$

(6) $= R\,N_4(s)\Big|_{s=j\lambda}$ $\qquad$ (7) $= I\,N_4(s)\Big|_{s=j\lambda}$

(8) $= R\,N_4(s)\Big|_{s=j\epsilon}$ $\qquad$ (9) $= I\,N_4(s)\Big|_{s=j\epsilon}$

(10) $= R\,N_4(s)\Big|_{s=-\alpha+j\beta}$ $\qquad$ (11) $= I\,N_4(s)\Big|_{s=-\alpha+j\beta}$

(12) $= R\,N_4(s)\Big|_{s=-\sigma+j\tau}$ $\qquad$ (13) $= I\,N_4(s)\Big|_{s=-\sigma+j\tau}$

(14) $= N_4'(s)\Big|_{s=-\gamma}$ $\qquad$ (15) $= N_4'(s)\Big|_{s=-\delta}$

(16) $= R\,N_4'(s)\Big|_{s=j\lambda}$ $\qquad$ (17) $= I\,N_4'(s)\Big|_{s=j\lambda}$

(18) $= R\,N_4'(s)\Big|_{s=-\alpha+j\beta}$ $\qquad$ (19) $= I\,N_4'(s)\Big|_{s=-\alpha+j\beta}$

(20) $= \beta^2(18) - \alpha\beta(19) - \alpha(10) - 2\beta(11)$ $\qquad$ (21) $= \alpha\beta(18) + \beta^2(19) + 2\beta(10) - \alpha(11)$

(22) $= [2\lambda(6) + \gamma(7)] - \lambda[\gamma(16) - \lambda(17)]$ $\qquad$ (23) $= [2\lambda(7) - \gamma(6)] - \lambda[\gamma(17) + \lambda(16)]$

(24) $= [2\beta(10) + (\gamma - \alpha)(11)] - \beta[(\gamma - \alpha)(18) - \beta(19)]$ $\qquad$ (25) $= [2\beta(11) - (\gamma - \alpha)(10)] - \beta[\beta(18) + (\gamma - \alpha)(19)]$

Section 7. Equations 6.1 to 6.51

F(s)	f(t)
Equation 6.1 $\frac{N_5(s)}{s^2(s+\gamma)(s+\delta)(s+\mu)(s+\eta)}$	$\frac{a_0 t + a_1}{\gamma\delta\mu\eta} - \frac{a_0(\gamma\delta\mu + \gamma\delta\eta + \gamma\mu\eta + \delta\mu\eta)}{\gamma^2\delta^2\mu^2\eta^2} + \frac{(1)e^{-\gamma t}}{\gamma^2(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)}$ $+ \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)(\mu-\delta)(\eta-\delta)} + \frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)(\delta-\mu)(\eta-\mu)} + \frac{(4)e^{-\eta t}}{\eta^2(\gamma-\eta)(\delta-\eta)(\mu-\eta)}$
Equation 6.2 $\frac{N_5(s)}{s^2(s+\gamma)^2(s+\delta)(s+\mu)}$	$\frac{a_0 t + a_1}{\gamma^2\delta\mu} - \frac{a_0(\gamma\delta + \gamma\mu + 2\delta\mu)}{\gamma^3\delta^2\mu^2} + \left[\frac{(1)t + (18)}{\gamma^2(\delta-\gamma)(\mu-\gamma)} - \frac{(1)[\gamma(\delta-\gamma)+\gamma(\mu-\gamma)-2(\delta-\gamma)(\mu-\gamma)]}{\gamma^3(\delta-\gamma)^2(\mu-\gamma)^2}\right]e^{-\gamma t}$ $+ \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)^2(\mu-\delta)} + \frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)^2(\delta-\mu)}$
Equation 6.3 $\frac{N_5(s)}{s^2(s+\gamma)(s+\delta)(s^2+\lambda^2)}$	$\frac{a_0 t + a_1}{\gamma\delta\lambda^2} - \frac{a_0(\gamma+\delta)}{\gamma^2\delta^2\lambda^2} + \frac{(1)e^{-\gamma t}}{\gamma^2(\delta-\gamma)(\gamma^2+\lambda^2)} + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)(\delta^2+\lambda^2)}$ $- \frac{1}{\lambda^3}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}}\cos(\lambda t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{\lambda}{\delta}$
Equation 6.4 $\frac{N_5(s)}{s^2(s+\gamma)(s+\delta)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0 t + a_1}{\gamma\delta A^2} - \frac{a_0(2\gamma\delta\alpha + \gamma A^2 + \delta A^2)}{\gamma^2\delta^2 A^4} + \frac{(1)e^{-\gamma t}}{\gamma^2(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]} + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)[(\alpha-\delta)^2+\beta^2]}$ $+ \frac{1}{\beta A^2}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}}\,e^{-\alpha t}\cos(\beta t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha}$

$F(s)$	$f(t)$
Equation 6.5 $\frac{N_5(s)}{s^2(s+\gamma)^2(s+\delta)^2}$	$\frac{a_0 t + a_1}{\gamma^2\delta^2} - \frac{2a_0(\gamma+\delta)}{\gamma^3\delta^3} + \left[\frac{(1)t+(18)}{\gamma^2(\delta-\gamma)^2} + \frac{2(1)[(\delta-\gamma)-\gamma]}{\gamma^3(\delta-\gamma)^3}\right] e^{-\gamma t}$ $+ \left[\frac{(2)t+(19)}{\delta^2(\gamma-\delta)^2} + \frac{2(2)[(\gamma-\delta)-\delta]}{\delta^3(\gamma-\delta)^3}\right] e^{-\delta t}$
Equation 6.6 $\frac{N_5(s)}{s^2(s+\gamma)^2(s^2+\lambda^2)}$	$\frac{a_0 t + a_1}{\gamma^2\lambda^2} - \frac{2a_0}{\gamma^3\lambda^2} + \left[\frac{(1)t+(18)}{\gamma^2(\gamma^2+\lambda^2)} + \frac{2(1)[(\gamma^2+\lambda^2)+\gamma^2]}{\gamma^3(\gamma^2+\lambda^2)^2}\right] e^{-\gamma t}$ $- \frac{1}{\lambda^3(\gamma^2+\lambda^2)}\sqrt{(6)^2+(7)^2}\cos(\lambda t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + 2\ \text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 6.7 $\frac{N_5(s)}{s^2(s+\gamma)^2[(s+\alpha)^2+\beta^2]}$	$\frac{a_0 t + a_1}{\gamma^2 A^2} - \frac{2a_0(A^2+\gamma\alpha)}{\gamma^3 A^4} + \left[\frac{(1)t+(18)}{\gamma^2[(\alpha-\gamma)^2+\beta^2]} + \frac{2(1)\{[(\alpha-\gamma)^2+\beta^2]-\gamma(\alpha-\gamma)\}}{\gamma^3[(\alpha-\gamma)^2+\beta^2]^2}\right] e$ $+ \frac{1}{\beta A^2[(\gamma-\alpha)^2+\beta^2]}\sqrt{(12)^2+(13)^2}\ e^{-\alpha t}\cos(\beta t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} - 2\ \text{TAN}^{-1}\frac{\beta}{\alpha} + 2\ \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 6.8 $\frac{N_5(s)}{s^2(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{a_0 t + a_1}{\lambda^2\epsilon^2} - \frac{\sqrt{(6)^2+(7)^2}}{\lambda^3(\epsilon^2-\lambda^2)}\cos(\lambda t - \psi_1) - \frac{\sqrt{(8)^2+(9)^2}}{\epsilon^3(\lambda^2-\epsilon^2)}\cos(\epsilon t - \psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} \qquad \psi_2 = \text{TAN}^{-1}\frac{(8)}{(9)}$

$F(s)$	$f(t)$
Equation 6.9 $\dfrac{N_5(s)}{s^2(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\dfrac{a_0 t + a_1}{\lambda^2 A^2} - \dfrac{2a_0\alpha}{\lambda^2 A^4} - \dfrac{1}{\lambda^3}\sqrt{\dfrac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t - \psi_1)$ $+ \dfrac{1}{\beta A^2}\sqrt{\dfrac{(12)^2+(13)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\, e^{-\alpha t}\cos(\beta t + \psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(6)}{(7)} + \text{TAN}^{-1}\dfrac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2} + 2\,\text{TAN}^{-1}\dfrac{\beta}{\alpha} - \text{TAN}^{-1}\dfrac{(12)}{(13)}$
Equation 6.10 $\dfrac{N_5(s)}{s^2[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\dfrac{a_0 t + a_1}{A^2 B^2} - \dfrac{2a_0(A^2\sigma + B^2\alpha)}{A^4 B^4} + \dfrac{1}{\beta A^2}\sqrt{\dfrac{(12)^2+(13)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\, e^{-\alpha t}\cos(\beta t - \psi_1)$ $+ \dfrac{1}{\tau B^2}\sqrt{\dfrac{(14)^2+(15)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\, e^{-\sigma t}\cos(\tau t - \psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(12)}{(13)} - 2\,\text{TAN}^{-1}\dfrac{\beta}{\alpha} + \text{TAN}^{-1}\dfrac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(14)}{(15)} - 2\,\text{TAN}^{-1}\dfrac{\tau}{\sigma} + \text{TAN}^{-1}\dfrac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$
Equation 6.11 $\dfrac{N_5(s)}{s^2(s^2+\lambda^2)^2}$	$\dfrac{a_0 t + a_1}{\lambda^4} + \dfrac{1}{2\lambda^4}\sqrt{(6)^2+(7)^2}\; t\cos(\lambda t + \psi_1)$ $- \dfrac{1}{2\lambda^5}\sqrt{[3(7)-\lambda(21)]^2+[\lambda(22)+3(6)]^2}\cos(\lambda t - \psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(7)}{(6)}$ $\psi_2 = \text{TAN}^{-1}\dfrac{\lambda(22)+3(6)}{3(7)-\lambda(21)}$

F(s)	f(t)
Equation 6.12 $\frac{N_5(s)}{s^2[(s+\alpha)^2+\beta^2]^2}$	$\frac{a_0 t + a_1}{A^4} - \frac{4a_0\alpha}{A^6} - \frac{1}{2A^2\beta^2}\sqrt{(12)^2+(13)^2}\; t e^{-\alpha t}\cos(\beta t+\psi_1) + \frac{1}{2A^3\beta^3}\sqrt{(25)^2+(26)^2}\; e^{-\alpha t}\cos(\beta t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} + 2\,\text{TAN}^{-1}\frac{\beta}{\alpha} \qquad \psi_2 = \text{TAN}^{-1}\frac{(26)}{(25)} - 2\,\text{TAN}^{-1}\frac{\alpha}{\beta} + \text{TAN}^{-1}\frac{\beta}{\alpha}$
Equation 6.13 $\frac{N_5(s)}{s(s+\gamma)(s+\delta)(s+\mu)(s+\eta)(s+\rho)}$	$\frac{a_0}{\gamma\delta\mu\eta\rho} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\mu-\delta)(\eta-\delta)(\rho-\delta)}$ $- \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)(\delta-\mu)(\eta-\mu)(\rho-\mu)} - \frac{(4)e^{-\eta t}}{\eta(\gamma-\eta)(\delta-\eta)(\mu-\eta)(\rho-\eta)} - \frac{(5)e^{-\rho t}}{\rho(\gamma-\rho)(\delta-\rho)(\mu-\rho)(\eta-\rho)}$
Equation 6.14 $\frac{N_5(s)}{s(s+\gamma)^2(s+\delta)(s+\mu)(s+\eta)}$	$\frac{a_0}{\gamma^2\delta\mu\eta} - \left[\frac{(1)t+(18)}{\gamma(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)} + \frac{(1)[(\delta-2\gamma)(\mu-\gamma)(\eta-\gamma) - \gamma(\delta-\gamma)(\eta+\mu-2\gamma)]}{\gamma^2(\delta-\gamma)^2(\mu-\gamma)^2(\eta-\gamma)^2}\right] e^{-\gamma}$ $- \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)^2(\delta-\mu)(\eta-\mu)} - \frac{(4)e^{-\eta t}}{\eta(\gamma-\eta)^2(\delta-\eta)(\mu-\eta)}$
Equation 6.15 $\frac{N_5(s)}{s(s+\gamma)(s+\delta)(s+\mu)(s^2+\lambda^2)}$	$\frac{a_0}{\gamma\delta\mu\lambda^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\mu-\delta)(\delta^2+\lambda^2)} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)(\delta-\mu)(\mu^2+\lambda^2)}$ $- \frac{1}{\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)}}\cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\gamma} - \text{TAN}^{-1}\frac{\lambda}{\delta} - \text{TAN}^{-1}\frac{\lambda}{\mu}$

F(s)	f(t)
Equation 6.16 $\frac{N_s(s)}{s(s+\gamma)(s+\delta)(s+\mu)[(s+\alpha)^2+\beta^2]}$	$\frac{a_o}{\gamma\delta\mu A^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2]} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\mu-\delta)[(\alpha-\delta)^2+\beta^2]}$ $- \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)(\delta-\mu)[(\alpha-\mu)^2+\beta^2]} - \frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} - \text{TAN}^{-1}\frac{\beta}{\mu-\alpha}$
Equation 6.17 $\frac{N_s(s)}{s(s+\gamma)^2(s+\delta)^2(s+\mu)}$	$\frac{a_o}{\gamma^2\delta^2\mu} - \left[\frac{(1)t+(18)}{\gamma(\delta-\gamma)^2(\mu-\gamma)} + \frac{(1)[(\delta-\gamma)(\mu-\gamma)-2\gamma(\mu-\gamma)-\gamma(\delta-\gamma)]}{\gamma^2(\delta-\gamma)^3(\mu-\gamma)^2}\right]e^{-\gamma t}$ $-\left[\frac{(2)t+(19)}{\delta(\gamma-\delta)^2(\mu-\delta)} + \frac{(2)[(\gamma-\delta)(\mu-\delta)-2\delta(\mu-\delta)-\delta(\gamma-\delta)]}{\delta^2(\gamma-\delta)^3(\mu-\delta)^2}\right]e^{-\delta t} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)^2(\delta-\mu)^2}$
Equation 6.18 $\frac{N_s(s)}{s(s+\gamma)^2(s+\delta)(s^2+\lambda^2)}$	$\frac{a_o}{\gamma^2\delta\lambda^2} - \left[\frac{(1)t+(18)}{\gamma(\delta-\gamma)(\gamma^2+\lambda^2)} + \frac{(1)[(\delta-2\gamma)(\gamma^2+\lambda^2)+2\gamma^2(\delta-\gamma)]}{\gamma^2(\delta-\gamma)^2(\gamma^2+\lambda^2)^2}\right]e^{-\gamma t} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)^2(\delta^2+\lambda^2)}$ $- \frac{1}{\lambda(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\delta^2+\lambda^2}}\cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\delta} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$

F(s)	f(t)
Equation 6.19 $\frac{N_5(s)}{s(s+\gamma)^2(s+\delta)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma^2\delta A^2} - \left[\frac{(1)t+(18)}{\gamma(\delta-\gamma)^2[(\alpha-\gamma)^2+\beta^2]} + \frac{(1)\{(\delta-2\gamma)[(\alpha-\gamma)^2+\beta^2]-2\gamma(\delta-\gamma)(\alpha-\gamma)\}}{\gamma^2(\delta-\gamma)^2[(\alpha-\gamma)^2+\beta^2]^2}\right]e^{-\gamma t}$ $-\frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)[(\alpha-\delta)^2+\beta^2]} - \frac{1}{\beta A[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{(\delta-\alpha)^2+\beta^2}}\,e^{-\alpha t}\cos(\beta t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 6.20 $\frac{N_5(s)}{s(s+\gamma)(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{a_0}{\gamma\lambda^2\epsilon^2} - \frac{(1)e^{-\gamma t}}{\gamma(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)} - \frac{1}{\lambda^2(\epsilon^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\cos(\lambda t+\psi_1)$ $-\frac{1}{\epsilon^2(\lambda^2-\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{\gamma^2+\epsilon^2}}\cos(\epsilon t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\gamma} \qquad \psi_2 = \text{TAN}^{-1}\frac{(9)}{(8)} - \text{TAN}^{-1}\frac{\epsilon}{\gamma}$
Equation 6.21 $\frac{N_5(s)}{s(s+\gamma)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma\lambda^2A^2} - \frac{(1)e^{-\gamma t}}{\gamma(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]} - \frac{1}{\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t+\psi_1)$ $-\frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\,e^{-\alpha t}\cos(\beta t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\gamma} - \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} + \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$

F(s)	f(t)
Equation 6.22 $\frac{N_s(s)}{s(s+\gamma)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{a_0}{\gamma A^2 B^2} - \frac{(1)e^{-\gamma t}}{\gamma[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]}$ $- \frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2+\tau^2-\beta^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $- \frac{1}{\tau B}\sqrt{\frac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2]\{[(\sigma-\alpha)^2+\tau^2-\beta^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\sigma t}\cos(\tau t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2+\tau^2-\beta^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(15)}{(14)} - \text{TAN}^{-1}\frac{\sigma}{\tau} - \text{TAN}^{-1}\frac{\tau}{\gamma-\sigma} - \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2+\beta^2-\tau^2}$
Equation 6.23 $\frac{N_s(s)}{s(s+\gamma)(s^2+\lambda^2)^2}$	$\frac{a_0}{\gamma\lambda^4} - \frac{(1)e^{-\gamma t}}{\gamma(\gamma^2+\lambda^2)^2} - \frac{1}{2\lambda^3}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\, t\cos(\lambda t-\psi_1)$ $- \frac{1}{2\lambda^4(\gamma^2+\lambda^2)}\sqrt{(27)^2+(28)^2}\cos(\lambda t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma}$ $\psi_2 = \text{TAN}^{-1}\frac{(28)}{(27)} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$

F(s)	f(t)
Equation 6.24 $\frac{N_s(s)}{s(s+\gamma)[(s+\alpha)^2+\beta^2]^2}$	$\frac{a_0}{\gamma A^4} - \frac{(1)e^{-\gamma t}}{\gamma[(\alpha-\gamma)^2+\beta^2]^2} + \frac{1}{2\beta^2 A}\sqrt{\frac{(12)^2+(13)^2}{(\gamma-\alpha)^2+\beta^2}}\, t\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $+\frac{1}{2\beta^3 A^2[(\gamma-\alpha)^2+\beta^2]}\sqrt{(29)^2+(30)^2}\; e^{-\alpha t}\cos(\beta t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} + \text{TAN}^{-1}\frac{\beta}{\alpha} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$ $\psi_2 = \text{TAN}^{-1}\frac{(30)}{(29)} + 2\,\text{TAN}^{-1}\frac{\beta}{\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 6.25 $\frac{N_s(s)}{(s+\gamma)^2(s+\delta)(s+\mu)(s+\eta)(s+\rho)}$	$\left[\frac{(1)t+(18)}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)} - \frac{(1)[(\eta-\gamma)(\rho-\gamma)(\mu+\delta-2\gamma)+(\delta-\gamma)(\mu-\gamma)(\eta+\rho-2\gamma)]}{(\delta-\gamma)^2(\mu-\gamma)^2(\eta-\gamma)^2(\rho-\gamma)^2}\right]e^{-\gamma t}$ $+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)(\rho-\delta)} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)(\eta-\mu)(\rho-\mu)} + \frac{(4)e^{-\eta t}}{(\gamma-\eta)^2(\delta-\eta)(\mu-\eta)(\rho-\eta)}$ $+\frac{(5)e^{-\rho t}}{(\gamma-\rho)^2(\delta-\rho)(\mu-\rho)(\eta-\rho)}$
Equation 6.26 $\frac{N_s(s)}{(s+\gamma)(s+\delta)(s+\mu)(s+\eta)(s^2+\lambda^2)}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\gamma^2+\lambda^2)} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\eta-\delta)(\delta^2+\lambda^2)} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\eta-\mu)(\mu^2+\lambda^2)}$ $+\frac{(4)e^{-\eta t}}{(\gamma-\eta)(\delta-\eta)(\mu-\eta)(\eta^2+\lambda^2)} + \frac{1}{\lambda}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)(\eta^2+\lambda^2)}}\cos(\lambda t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{\lambda}{\delta} + \text{TAN}^{-1}\frac{\lambda}{\mu} + \text{TAN}^{-1}\frac{\lambda}{\eta}$

F(s)	f(t)
Equation 6.27 $\frac{N_5(s)}{(s+\gamma)(s+\delta)(s+\mu)(s+\eta)[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)[(\alpha-\gamma)^2+\beta^2]} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\eta-\delta)[(\alpha-\delta)^2+\beta^2]}$ $+ \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\eta-\mu)[(\alpha-\mu)^2+\beta^2]} + \frac{(4)e^{-\eta t}}{(\gamma-\eta)(\delta-\eta)(\mu-\eta)[(\alpha-\eta)^2+\beta^2]}$ $+ \frac{1}{\beta}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2][(\eta-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} + \text{TAN}^{-1}\frac{\beta}{\mu-\alpha} + \text{TAN}^{-1}\frac{\beta}{\eta-\alpha}$
Equation 6.28 $\frac{N_5(s)}{(s+\gamma)^2(s+\delta)^2(s+\mu)(s+\eta)}$	$\left[\frac{(1)t+(18)}{(\delta-\gamma)^2(\mu-\gamma)(\eta-\gamma)} - \frac{(1)[(\delta-\gamma)(\mu+\eta-2\gamma)+2(\mu-\gamma)(\eta-\gamma)]}{(\delta-\gamma)^3(\mu-\gamma)^2(\eta-\gamma)^2}\right]e^{-\gamma t}$ $+\left[\frac{(2)t+(19)}{(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)} - \frac{(2)[(\gamma-\delta)(\mu+\eta-2\delta)+2(\mu-\delta)(\eta-\delta)]}{(\gamma-\delta)^3(\mu-\delta)^2(\eta-\delta)^2}\right]e^{-\delta t}$ $+ \frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)^2(\eta-\mu)} + \frac{(4)e^{-\eta t}}{(\gamma-\eta)^2(\delta-\eta)^2(\mu-\eta)}$
Equation 6.29 $\frac{N_5(s)}{(s+\gamma)^2(s+\delta)(s+\mu)(s^2+\lambda^2)}$	$\left[\frac{(1)t+(18)}{(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)} - \frac{(1)[(\gamma^2+\lambda^2)(\delta+\mu-2\gamma)-2\gamma(\delta-\gamma)(\mu-\gamma)]}{(\delta-\gamma)^2(\mu-\gamma)^2(\gamma^2+\lambda^2)^2}\right]e^{-\gamma t}$ $+ \frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\mu-\delta)^2(\delta^2+\lambda^2)} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)(\mu^2+\lambda^2)} + \frac{1}{\lambda(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(\delta^2+\lambda^2)(\mu^2+\lambda^2)}}\cos(\lambda t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\mu} + \text{TAN}^{-1}\frac{\lambda}{\delta} + 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$

F(s)	
Equation 6.30 $\frac{N_5(s)}{(s+\gamma)^2(s+\delta)(s+\mu)[(s+\alpha)^2+\beta^2]}$	$\left[\frac{(1)t+(18)}{(\delta-\gamma)(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2]} - \frac{(1)\{[(\alpha-\gamma)^2+\beta^2](\delta+\mu-2\gamma)+2(\delta-\gamma)(\mu-\gamma)(\alpha-\gamma)\}}{(\delta-\gamma)^2(\mu-\gamma)^2[(\alpha-\gamma)^2+\beta^2]^2}\right] e^{-\gamma t}$ $+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\mu-\delta)[(\alpha-\delta)^2+\beta^2]} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)[(\alpha-\mu)^2+\beta^2]}$ $+\frac{1}{\beta[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{[(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} + \text{TAN}^{-1}\frac{\beta}{\mu-\alpha}$
Equation 6.31 $\frac{N_6(s)}{(s+\gamma)(s+\delta)(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\delta^2+\lambda^2)(\delta^2+\epsilon^2)}$ $+\frac{1}{\lambda(\epsilon^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}}\cos(\lambda t-\psi_1)$ $+\frac{1}{\epsilon(\lambda^2-\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{(\gamma^2+\epsilon^2)(\delta^2+\epsilon^2)}}\cos(\epsilon t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{\lambda}{\delta}$ $\psi_2 = \text{TAN}^{-1}\frac{(8)}{(9)} + \text{TAN}^{-1}\frac{\epsilon}{\gamma} + \text{TAN}^{-1}\frac{\epsilon}{\delta}$

F(s)	f(t)
Equation 6.32 $\dfrac{N_s(s)}{(s+\gamma)(s+\delta)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\dfrac{(1)e^{-\gamma t}}{(\delta-\gamma)(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]} + \dfrac{(2)e^{-\delta t}}{(\gamma-\delta)(\delta^2+\lambda^2)[(\alpha-\delta)^2+\beta^2]}$ $+\dfrac{1}{\lambda}\sqrt{\dfrac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $+\dfrac{1}{\beta}\sqrt{\dfrac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(6)}{(7)} + \text{TAN}^{-1}\dfrac{\lambda}{\gamma} + \text{TAN}^{-1}\dfrac{\lambda}{\delta} + \text{TAN}^{-1}\dfrac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(12)}{(13)} + \text{TAN}^{-1}\dfrac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\dfrac{\beta}{\delta-\alpha} - \text{TAN}^{-1}\dfrac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$
Equation 6.33 $\dfrac{N_s(s)}{(s+\gamma)(s+\delta)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\dfrac{(1)e^{-\gamma t}}{(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]} + \dfrac{(2)e^{-\delta t}}{(\gamma-\delta)[(\alpha-\delta)^2+\beta^2][(\sigma-\delta)^2+\tau^2]}$ $+\dfrac{1}{\beta}\sqrt{\dfrac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}e^{-\alpha t}\cos(\beta t-\psi_1)$ $+\dfrac{1}{\tau}\sqrt{\dfrac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2][(\delta-\sigma)^2+\tau^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}e^{-\sigma t}\cos(\tau t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(12)}{(13)} + \text{TAN}^{-1}\dfrac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\dfrac{\beta}{\delta-\alpha} + \text{TAN}^{-1}\dfrac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(14)}{(15)} + \text{TAN}^{-1}\dfrac{\tau}{\gamma-\sigma} + \text{TAN}^{-1}\dfrac{\tau}{\delta-\sigma} + \text{TAN}^{-1}\dfrac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$

F(s)	f(t)
Equation 6.34 $\dfrac{N_s(s)}{(s+\gamma)(s+\delta)(s^2+\lambda^2)^2}$	$\dfrac{(1)e^{-\gamma t}}{(\delta-\gamma)(\gamma^2+\lambda^2)^2} + \dfrac{(2)e^{-\delta t}}{(\gamma-\delta)(\delta^2+\lambda^2)^2} - \dfrac{1}{2\lambda^2}\sqrt{\dfrac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}}\; t\cos(\lambda t+\psi_1)$ $- \dfrac{1}{2\lambda^3(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}\sqrt{(31)^2+(32)^2}\;\cos(\lambda t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(7)}{(6)} - \text{TAN}^{-1}\dfrac{\lambda}{\gamma} - \text{TAN}^{-1}\dfrac{\lambda}{\delta}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(32)}{(31)} - 2\,\text{TAN}^{-1}\dfrac{\lambda}{\gamma} - 2\,\text{TAN}^{-1}\dfrac{\lambda}{\delta}$
Equation 6.35 $\dfrac{N_s(s)}{(s+\gamma)(s+\delta)[(s+\alpha)^2+\beta^2]^2}$	$\dfrac{(1)e^{-\gamma t}}{(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]^2} + \dfrac{(2)e^{-\delta t}}{(\gamma-\delta)[(\alpha-\delta)^2+\beta^2]^2}$ $- \dfrac{1}{2\beta^2}\sqrt{\dfrac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}}\; t\,e^{-\alpha t}\cos(\beta t+\psi_1)$ $- \dfrac{1}{2\beta^3[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}\sqrt{(33)^2+(34)^2}\;e^{-\alpha t}\cos(\beta t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(13)}{(12)} - \text{TAN}^{-1}\dfrac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\dfrac{\beta}{\delta-\alpha}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(34)}{(33)} - 2\,\text{TAN}^{-1}\dfrac{\beta}{\gamma-\alpha} - 2\,\text{TAN}^{-1}\dfrac{\beta}{\delta-\alpha}$

F(s)	f(t)
Equation 6.36 $\dfrac{N_5(s)}{(s+\gamma)^2(s+\delta)^2(s+\mu)^2}$	$\left[\dfrac{(1)t+(18)}{(\delta-\gamma)^2(\mu-\gamma)^2} - \dfrac{2(1)(\delta+\mu-2\gamma)}{(\delta-\gamma)^3(\mu-\gamma)^3}\right]e^{-\gamma t} + \left[\dfrac{(2)t+(19)}{(\gamma-\delta)^2(\mu-\delta)^2} - \dfrac{2(2)(\gamma+\mu-2\delta)}{(\gamma-\delta)^3(\mu-\delta)^3}\right]e^{-\delta t}$ $+ \left[\dfrac{(3)t+(20)}{(\gamma-\mu)^2(\delta-\mu)^2} - \dfrac{2(3)(\gamma+\delta-2\mu)}{(\gamma-\mu)^3(\delta-\mu)^3}\right]e^{-\mu t}$
Equation 6.37 $\dfrac{N_5(s)}{(s+\gamma)^2(s+\delta)^2(s^2+\lambda^2)}$	$\left[\dfrac{(1)t+(18)}{(\delta-\gamma)^2(\gamma^2+\lambda^2)} - \dfrac{2(1)(2\gamma^2+\lambda^2-\gamma\delta)}{(\delta-\gamma)^3(\gamma^2+\lambda^2)^2}\right]e^{-\gamma t} + \left[\dfrac{(2)t+(19)}{(\gamma-\delta)^2(\delta^2+\lambda^2)} - \dfrac{2(2)(2\delta^2+\lambda^2-\gamma\delta)}{(\gamma-\delta)^3(\delta^2+\lambda^2)^2}\right]e^{-\delta t}$ $+ \dfrac{1}{\lambda(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}\sqrt{(6)^2+(7)^2}\cos(\lambda t-\psi)$ $\psi = \text{TAN}^{-1}\dfrac{(6)}{(7)} + 2\,\text{TAN}^{-1}\dfrac{\lambda}{\gamma} + 2\,\text{TAN}^{-1}\dfrac{\lambda}{\delta}$
Equation 6.38 $\dfrac{N_5(s)}{(s+\gamma)^2(s+\delta)^2[(s+\alpha)^2+\beta^2]}$	$\left[\dfrac{(1)t+(18)}{(\delta-\gamma)^2[(\alpha-\gamma)^2+\beta^2]} - \dfrac{2(1)\{[(\alpha-\gamma)^2+\beta^2]+(\delta-\gamma)(\alpha-\gamma)\}}{(\delta-\gamma)^3[(\alpha-\gamma)^2+\beta^2]^2}\right]e^{-\gamma t}$ $\left[\dfrac{(2)t+(19)}{(\gamma-\delta)^2[(\alpha-\delta)^2+\beta^2]} - \dfrac{2(2)\{[(\alpha-\delta)^2+\beta^2]+(\gamma-\delta)(\alpha-\delta)\}}{(\gamma-\delta)^3[(\alpha-\delta)^2+\beta^2]^2}\right]e^{-\delta t}$ $+ \dfrac{1}{\beta[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}\sqrt{(12)^2+(13)^2}\,e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\dfrac{(12)}{(13)} + 2\,\text{TAN}^{-1}\dfrac{\beta}{\gamma-\alpha} + 2\,\text{TAN}^{-1}\dfrac{\beta}{\delta-\alpha}$

F(s)	f(t)
Equation 6.39 $\frac{N_s(s)}{(s+\gamma)^2(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\left[\frac{(1)t+(18)}{(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)} + \frac{2\gamma(1)(\lambda^2+\epsilon^2+2\gamma^2)}{(\gamma^2+\lambda^2)^2(\gamma^2+\epsilon^2)^2}\right] e^{-\gamma t}$ $+\frac{1}{\lambda(\epsilon^2-\lambda^2)(\gamma^2+\lambda^2)}\sqrt{(6)^2+(7)^2}\cos(\lambda t-\psi_1)+\frac{1}{\epsilon(\lambda^2-\epsilon^2)(\gamma^2+\epsilon^2)}\sqrt{(8)^2+(9)^2}\cos(\epsilon t-$ $\psi_1 = \tan^{-1}\frac{(6)}{(7)} + 2\tan^{-1}\frac{\lambda}{\gamma}$ $\psi_2 = \tan^{-1}\frac{(8)}{(9)} + 2\tan^{-1}\frac{\epsilon}{\gamma}$
Equation 6.40 $\frac{N_s(s)}{(s+\gamma)^2(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\left[\frac{(1)t+(18)}{(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]} + \frac{2(1)\{\gamma[(\alpha-\gamma)^2+\beta^2]-(\alpha-\gamma)(\gamma^2+\lambda^2)\}}{(\gamma^2+\lambda^2)^2[(\alpha-\gamma)^2+\beta^2]^2}\right] e^{-\gamma t}$ $+\frac{1}{\lambda(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t-\psi_1)$ $+\frac{1}{\beta[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1 = \tan^{-1}\frac{(6)}{(7)} + 2\tan^{-1}\frac{\lambda}{\gamma} + \tan^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \tan^{-1}\frac{(12)}{(13)} + 2\tan^{-1}\frac{\beta}{\gamma-\alpha} - \tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)
Equation 6.41 $\dfrac{N_s(s)}{(s+\gamma)^2[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\left[\dfrac{(1)t+(18)}{[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]} \quad \dfrac{2(1)\{(\alpha-\gamma)[(\sigma-\gamma)^2+\tau^2]+(\sigma-\gamma)[(\alpha-\gamma)^2+\beta^2]\}}{[(\alpha-\gamma)^2+\beta^2]^2[(\sigma-\gamma)^2+\tau^2]^2}\right] e^{-\gamma t}$ $+\dfrac{1}{\beta[(\gamma-\alpha)^2+\beta^2]}\sqrt{\dfrac{(12)^2+(13)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\; e^{-\alpha t}\cos(\beta t-\psi_1)$ $+\dfrac{1}{\tau[(\gamma-\sigma)^2+\tau^2]}\sqrt{\dfrac{(14)^2+(15)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\; e^{-\sigma t}\cos(\tau t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(12)}{(13)} + 2\,\text{TAN}^{-1}\dfrac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\dfrac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(14)}{(15)} + 2\,\text{TAN}^{-1}\dfrac{\tau}{\gamma-\sigma} + \text{TAN}^{-1}\dfrac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$
Equation 6.42 $\dfrac{N_s(s)}{(s+\gamma)^2(s^2+\lambda^2)^2}$	$\left[\dfrac{(1)t+(18)}{(\gamma^2+\lambda^2)^2}+\dfrac{4\gamma(1)}{(\gamma^2+\lambda^2)^3}\right] e^{-\gamma t}$ $-\dfrac{1}{2\lambda^2(\gamma^2+\lambda^2)}\sqrt{(6)^2+(7)^2}\; t\cos(\lambda t+\psi_1)$ $+\dfrac{1}{2\lambda^3(\gamma^2+\lambda^2)}\sqrt{\dfrac{(35)^2+(36)^2}{\gamma^2+\lambda^2}}\cos(\lambda t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(7)}{(6)} - 2\,\text{TAN}^{-1}\dfrac{\lambda}{\gamma}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(36)}{(35)} + 3\,\text{TAN}^{-1}\dfrac{\lambda}{\gamma}$

F(s)	f(t)
Equation 6.43 $\frac{N_5(s)}{(s+\gamma)^2[(s+\alpha)^2+\beta^2]^2}$	$\left[\frac{(1)t+(18)}{[(\alpha-\gamma)^2+\beta^2]^2} - \frac{4(1)(\alpha-\gamma)}{[(\alpha-\gamma)^2+\beta^2]^3}\right] e^{-\gamma t}$ $- \frac{1}{2\beta^2[(\gamma-\alpha)^2+\beta^2]} \sqrt{(12)^2+(13)^2}\; t\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $+ \frac{1}{2\beta^3[(\gamma-\alpha)^2+\beta^2]} \sqrt{\frac{(37)^2+(38)^2}{(\gamma-\alpha)^2+\beta^2}}\; e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} - 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$ $\psi_2 = \text{TAN}^{-1}\frac{(38)}{(37)} + 3\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 6.44 $\frac{N_5(s)}{(s^2+\lambda^2)(s^2+\epsilon^2)(s^2+k^2)}$	$\frac{1}{\lambda(\epsilon^2-\lambda^2)(k^2-\lambda^2)} \sqrt{(6)^2+(7)^2}\;\cos(\lambda t-\psi_1)$ $+ \frac{1}{\epsilon(\lambda^2-\epsilon^2)(k^2-\epsilon^2)} \sqrt{(8)^2+(9)^2}\;\cos(\epsilon t-\psi_2)$ $+ \frac{1}{k(\lambda^2-k^2)(\epsilon^2-k^2)} \sqrt{(10)^2+(11)^2}\;\cos(kt-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} \qquad \psi_2 = \text{TAN}^{-1}\frac{(8)}{(9)} \qquad \psi_3 = \text{TAN}^{-1}\frac{(10)}{(11)}$

F(s)	f(t)
Equation 6.45 $\dfrac{N_5(s)}{(s^2+\lambda^2)(s^2+\epsilon^2)[(s+\alpha)^2+\beta^2]}$	$\dfrac{1}{\lambda(\epsilon^2-\lambda^2)}\sqrt{\dfrac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t-\psi_1)+\dfrac{1}{\epsilon(\lambda^2-\epsilon^2)}\sqrt{\dfrac{(8)^2+(9)^2}{(A^2-\epsilon^2)^2+4\alpha^2\epsilon^2}}\cos(\epsilon t-\psi_2)$ $+\dfrac{1}{\beta}\sqrt{\dfrac{(12)^2+(13)^2}{[(A^2-\lambda^2)^2+4\alpha^2\lambda^2][(A^2-\epsilon^2)^2+4\alpha^2\epsilon^2]}}e^{-\alpha t}\cos(\beta t+\psi_3)$ $\psi_1=\text{TAN}^{-1}\dfrac{(6)}{(7)}+\text{TAN}^{-1}\dfrac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2=\text{TAN}^{-1}\dfrac{(8)}{(9)}+\text{TAN}^{-1}\dfrac{2\alpha\epsilon}{A^2-\epsilon^2}$ $\psi_3=\text{TAN}^{-1}\dfrac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}+\text{TAN}^{-1}\dfrac{2\alpha\beta}{\alpha^2-\beta^2+\epsilon^2}-\text{TAN}^{-1}\dfrac{(12)}{(13)}$
Equation 6.46 $\dfrac{N_5(s)}{(s^2+\lambda^2)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\dfrac{1}{\lambda}\sqrt{\dfrac{(6)^2+(7)^2}{[(A^2-\lambda^2)^2+4\alpha^2\lambda^2][(B^2-\lambda^2)^2+4\sigma^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $+\dfrac{1}{\beta}\sqrt{\dfrac{(12)^2+(13)^2}{[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}e^{-\alpha t}\cos(\beta t-\psi_2)$ $+\dfrac{1}{\tau}\sqrt{\dfrac{(14)^2+(15)^2}{[(B^2-\lambda^2)^2+4\sigma^2\lambda^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}e^{-\sigma t}\cos(\tau t-\psi_3)$ $\psi_1=\text{TAN}^{-1}\dfrac{(6)}{(7)}+\text{TAN}^{-1}\dfrac{2\alpha\lambda}{A^2-\lambda^2}+\text{TAN}^{-1}\dfrac{2\sigma\lambda}{B^2-\lambda^2}$ $\psi_2=\text{TAN}^{-1}\dfrac{(12)}{(13)}+\text{TAN}^{-1}\dfrac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}-\text{TAN}^{-1}\dfrac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$ $\psi_3=\text{TAN}^{-1}\dfrac{(14)}{(15)}+\text{TAN}^{-1}\dfrac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2+\beta^2-\tau^2}-\text{TAN}^{-1}\dfrac{2\sigma\tau}{\sigma^2-\tau^2+\lambda^2}$

F(s)	f(t)
Equation 6.47 $\frac{N_5(s)}{(s^2+\lambda^2)^2(s^2+\epsilon^2)}$	$\frac{1}{\epsilon(\lambda^2-\epsilon^2)^2}\sqrt{(8)^2+(9)^2}\cos(\epsilon t-\psi_1) - \frac{1}{2\lambda^2(\epsilon^2-\lambda^2)}\sqrt{(6)^2+(7)^2}\, t\cos(\lambda t$ $+\frac{1}{2\lambda^3(\epsilon^2-\lambda^2)^2}\sqrt{\lambda^2(\lambda^2-\epsilon^2)^2[(21)^2+(22)^2]+(3\lambda^2-\epsilon^2)^2[(6)^2+(7)^2]}\cos(\lambda t+\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(8)}{(9)} \qquad \psi_2 = \text{TAN}^{-1}\frac{(7)}{(6)}$ $\psi_3 = \text{TAN}^{-1}\frac{\lambda(\lambda^2-\epsilon^2)(22)+(3\lambda^2-\epsilon^2)(6)}{\lambda(\lambda^2-\epsilon^2)(21)-(3\lambda^2-\epsilon^2)(7)}$
Equation 6.48 $\frac{N_5(s)}{(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]^2}$	$\frac{1}{\lambda}\sqrt{\frac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t-\psi_1)$ $-\frac{1}{2\beta^2}\sqrt{\frac{(12)^2+(13)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\, t\, e^{-\alpha t}\cos(\beta t+\psi_2)$ $-\frac{1}{2\beta^3[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(39)^2+(40)^2}\, e^{-\alpha t}\cos(\beta t+\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(13)}{(12)} + \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$ $\psi_3 = \text{TAN}^{-1}\frac{(40)}{(39)} + 2\,\text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)
Equation 6.49 $\dfrac{N_5(s)}{(s^2+\lambda^2)^2[(s+\alpha)^2+\beta^2]}$	$-\dfrac{1}{2\lambda^2}\sqrt{\dfrac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\; t\cos(\lambda t+\psi_1) - \dfrac{1}{2\lambda^3[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(41)^2+(42)^2}\cos(\lambda t+\psi_2)$ $+\dfrac{1}{\beta[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(12)^2+(13)^2}\; e^{-\alpha t}\cos(\beta t+\psi_3)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(7)}{(6)} - \text{TAN}^{-1}\dfrac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(42)}{(41)} + 2\,\text{TAN}^{-1}\dfrac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_3 = 2\,\text{TAN}^{-1}\dfrac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2} - \text{TAN}^{-1}\dfrac{(12)}{(13)}$
Equation 6.50 $\dfrac{N_5(s)}{[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2][(s+\zeta)^2+\varphi^2]}$	$\dfrac{1}{\beta}\sqrt{\dfrac{(12)^2+(13)^2}{\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}\{[(\zeta-\alpha)^2-\beta^2+\varphi^2]^2+4\beta^2(\zeta-\alpha)^2\}}}\; e^{-\alpha t}\cos(\beta t-\psi_1)$ $+\dfrac{1}{\tau}\sqrt{\dfrac{(14)^2+(15)^2}{\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}\{[(\zeta-\sigma)^2-\tau^2+\varphi^2]^2+4\tau^2(\zeta-\sigma)^2\}}}\; e^{-\sigma t}\cos(\tau t-\psi_2)$ $+\dfrac{1}{\varphi}\sqrt{\dfrac{(16)^2+(17)^2}{\{[(\zeta-\alpha)^2-\beta^2+\varphi^2]^2+4\beta^2(\zeta-\alpha)^2\}\{[(\zeta-\sigma)^2-\tau^2+\varphi^2]^2+4\tau^2(\zeta-\sigma)^2\}}}\; e^{-\zeta t}\cos(\varphi t-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(12)}{(13)} + \text{TAN}^{-1}\dfrac{2\beta(\zeta-\alpha)}{(\zeta-\alpha)^2-\beta^2+\varphi^2} + \text{TAN}^{-1}\dfrac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(14)}{(15)} + \text{TAN}^{-1}\dfrac{2\tau(\zeta-\sigma)}{(\zeta-\sigma)^2-\tau^2+\varphi^2} + \text{TAN}^{-1}\dfrac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$ $\psi_3 = \text{TAN}^{-1}\dfrac{(16)}{(17)} + \text{TAN}^{-1}\dfrac{2\varphi(\sigma-\zeta)}{(\sigma-\zeta)^2-\varphi^2+\tau^2} + \text{TAN}^{-1}\dfrac{2\varphi(\alpha-\zeta)}{(\alpha-\zeta)^2-\varphi^2+\beta^2}$

F(s)	f(t)
Equation 6.51 $\frac{N_s(s)}{[(s+\alpha)^2+\beta^2]^2[(s+\sigma)^2+\tau^2]}$	$-\frac{1}{2\beta^2}\sqrt{\frac{(12)^2+(13)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\; t\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $-\frac{1}{2\beta^3\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}\sqrt{(43)^2+(44)^2}\; e^{-\alpha t}\cos(\beta t+\psi_2)$ $+\frac{1}{\tau}\sqrt{\frac{(14)^2+(15)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\; e^{-\sigma t}\cos(\tau t-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(44)}{(43)} - 2\,\text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_3 = \text{TAN}^{-1}\frac{(14)}{(15)} + \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2+\beta^2-\tau^2}$

ABBREVIATIONS

$N_5(s) = a_5 s^5 + a_4 s^4 + a_3 s^3 + a_2 s^2 + a_1 s + a_0$ $\qquad N_5'(s) = 5a_5 s^4 + 4a_4 s^3 + 3a_3 s^2 + 2a_2 s + a_1$

$A^2 = \alpha^2 + \beta^2$ $\qquad B^2 = \sigma^2 + \tau^2$

$(1) = N_5(s)\big|_{s=-\gamma}$ $\qquad (2) = N_5(s)\big|_{s=-\delta}$

$(3) = N_5(s)\big|_{s=-\mu}$ $\qquad (4) = N_5(s)\big|_{s=-\eta}$

$(5) = N_5(s)\big|_{s=-\rho}$

$(6) = R\ N_5(s)\big|_{s=j\lambda}$ $\qquad (7) = I\ N_5(s)\big|_{s=j\lambda}$

$(8) = R\ N_5(s)\big|_{s=j\epsilon}$ $\qquad (9) = I\ N_5(s)\big|_{s=j\epsilon}$

$(10) = R\ N_5(s)\big|_{s=jk}$ $\qquad (11) = I\ N_5(s)\big|_{s=jk}$

$(12) = R\ N_5(s)\big|_{s=-\alpha+j\beta}$ $\qquad (13) = I\ N_5(s)\big|_{s=-\alpha+j\beta}$

$(14) = R\ N_5(s)\big|_{s=-\sigma+j\tau}$ $\qquad (15) = I\ N_5(s)\big|_{s=-\sigma+j\tau}$

$(16) = R\ N_5(s)\big|_{s=-\zeta+j\varphi}$ $\qquad (17) = I\ N_5(s)\big|_{s=-\zeta+j\varphi}$

$(18) = N_5'(s)\big|_{s=-\gamma}$ $\qquad (19) = N_5'(s)\big|_{s=-\delta}$

$(20) = N_5'(s)\big|_{s=-\mu}$

$(21) = R\ N_5'(s)\big|_{s=j\lambda}$ $\qquad (22) = I\ N_5'(s)\big|_{s=j\lambda}$

$(23) = R\ N_5'(s)\big|_{s=-\alpha+j\beta}$ $\qquad (24) = I\ N_5'(s)\big|_{s=-\alpha+j\beta}$

$(25) = \alpha[\beta(23) - (13)] + \beta[\beta(24) + 3(12)]$

$(26) = \alpha[\beta(24) + (12)] - \beta[\beta(23) - 3(13)]$

$$(27) = \lambda[\lambda(21) - 2(7)] + \gamma[\lambda(22) + 2(6)]$$

$$(28) = \lambda[\lambda(22) + 2(6)] - \gamma[\lambda(21) - 2(7)]$$

$$(29) = \beta(23)[\alpha(\gamma-\alpha)+\beta^2] + \beta(\gamma-2\alpha)[\beta(24) + 2(12)] - (13)[3\beta^2 + \alpha(\gamma-\alpha)]$$

$$(30) = \beta(24)[\alpha(\gamma-\alpha)+\beta^2] - \beta(\gamma-2\alpha)[\beta(23) - 2(13)] + (12)[3\beta^2 + \alpha(\gamma-\alpha)]$$

$$(31) = (\gamma\delta - \lambda^2)[\lambda(21) - (7)] - \lambda(\gamma+\delta)[\lambda(22) + 2(6)] + 2\lambda^2(7)$$

$$(32) = (\gamma\delta - \lambda^2)[\lambda(22) + (6)] + \lambda(\gamma+\delta)[\lambda(21) - 2(7)] - 2\lambda^2(6)$$

$$(33) = [(\gamma-\alpha)(\delta-\alpha) - \beta^2][\beta(23) - (13)] - \beta[(\gamma-\alpha)+(\delta-\alpha)][\beta(24) + 2(12)] + 2\beta^2(13)$$

$$(34) = [(\gamma-\alpha)(\delta-\alpha) - \beta^2][\beta(24) + (12)] + \beta[(\gamma-\alpha)+(\delta-\alpha)][\beta(23) - 2(13)] - 2\beta^2(12)$$

$$(35) = \lambda[\lambda(22) + 3(6)] - \gamma[\lambda(21) - (7)]$$

$$(36) = \lambda[\lambda(21) - 3(7)] + \gamma[\lambda(22) + (6)]$$

$$(37) = \beta[\beta(24) + 3(12)] - (\gamma-\alpha)[\beta(23) - (13)]$$

$$(38) = \beta[\beta(23) - 3(13)] + (\gamma-\alpha)[\beta(24) + (12)]$$

$$(39) = (\alpha^2 - \beta^2 + \lambda^2)[\beta(23) - (13)] + 2\alpha\beta[\beta(24) + 2(12)] + 2\beta^2(13)$$

$$(40) = (\alpha^2 - \beta^2 + \lambda^2)[\beta(24) + (12)] - 2\alpha\beta[\beta(23) - 2(13)] - 2\beta^2(12)$$

$$(41) = (A^2 - \lambda^2)[\lambda(21) - (7)] - 2\alpha\lambda[\lambda(22) + 2(6)] + 2\lambda^2(7)$$

$$(42) = (A^2 - \lambda^2)[\lambda(22) + (6)] + 2\alpha\lambda[\lambda(21) - 2(7)] - 2\lambda^2(6)$$

$$(43) = [(\sigma-\alpha)^2 - \beta^2 + \tau^2][\beta(23) - (13)] - 2\beta(\sigma-\alpha)[\beta(24) + 2(12)] + 2\beta^2(13)$$

$$(44) = [(\sigma-\alpha)^2 - \beta^2 + \tau^2][\beta(24) + (12)] + 2\beta(\sigma-\alpha)[\beta(23) - 2(13)] - 2\beta^2(12)$$

Section 8. Equations 7.1 to 7.65

F(s)	f(t)
Equation 7.1 $\frac{N_6(s)}{s^2(s+\gamma)(s+\delta)(s+\mu)(s+\eta)(s+\rho)}$	$\frac{a_0 t + a_1}{\gamma\delta\mu\eta\rho} - \frac{a_0}{\gamma\delta\mu\eta\rho}\left[\frac{1}{\gamma}+\frac{1}{\delta}+\frac{1}{\mu}+\frac{1}{\eta}+\frac{1}{\rho}\right]$ $+\frac{(1)e^{-\gamma t}}{\gamma^2(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)} + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)(\mu-\delta)(\eta-\delta)(\rho-\delta)}$ $+\frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)(\delta-\mu)(\eta-\mu)(\rho-\mu)} + \frac{(4)e^{-\eta t}}{\eta^2(\gamma-\eta)(\delta-\eta)(\mu-\eta)(\rho-\eta)}$ $+\frac{(5)e^{-\rho t}}{\rho^2(\gamma-\rho)(\delta-\rho)(\mu-\rho)(\eta-\rho)}$
Equation 7.2 $\frac{N_6(s)}{s^2(s+\gamma)^2(s+\delta)(s+\mu)(s+\eta)}$	$\frac{a_0 t + a_1}{\gamma^2\delta\mu\eta} - \frac{a_0}{\gamma^2\delta\mu\eta}\left[\frac{2}{\gamma}+\frac{1}{\delta}+\frac{1}{\mu}+\frac{1}{\eta}\right]$ $+\left[\frac{(1)t+(18)}{\gamma^2(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)} - \frac{(1)}{\gamma^2(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)}\left\{-\frac{2}{\gamma}+\frac{1}{\delta-\gamma}+\frac{1}{\mu-\gamma}+\frac{1}{\eta-\gamma}\right\}\right]$ $+\frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)} + \frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)^2(\delta-\mu)(\eta-\mu)} + \frac{(4)e^{-\eta t}}{\eta^2(\gamma-\eta)^2(\delta-\eta)(\mu-\eta)}$
Equation 7.3 $\frac{N_6(s)}{s^2(s+\gamma)(s+\delta)(s+\mu)(s^2+\lambda^2)}$	$\frac{a_0 t + a_1}{\gamma\delta\mu\lambda^2} - \frac{a_0}{\gamma\delta\mu\lambda^2}\left[\frac{1}{\gamma}+\frac{1}{\delta}+\frac{1}{\mu}\right] + \frac{(1)e^{-\gamma t}}{\gamma^2(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)} + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)(\mu-\delta)(\delta^2+\lambda^2)}$ $+\frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)(\delta-\mu)(\mu^2+\lambda^2)} - \frac{1}{\lambda^3}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)}}\cos(\lambda t - \psi)$ $\psi = \tan^{-1}\frac{(6)}{(7)} + \tan^{-1}\frac{\lambda}{\gamma} + \tan^{-1}\frac{\lambda}{\delta} + \tan^{-1}\frac{\lambda}{\mu}$

F(s)	f(t)
Equation 7.4 $\frac{N_6(s)}{s^2(s+\gamma)(s+\delta)(s+\mu)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0 t + a_1}{\gamma\delta\mu A^2} - \frac{a_0}{\gamma\delta\mu A^2}\left[\frac{1}{\gamma}+\frac{1}{\delta}+\frac{1}{\mu}+\frac{2\alpha}{A^2}\right] + \frac{(1)e^{-\gamma t}}{\gamma^2(\delta-\gamma)(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2]}$ $+ \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)(\mu-\delta)[(\alpha-\delta)^2+\beta^2]} + \frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)(\delta-\mu)[(\alpha-\mu)^2+\beta^2]}$ $+ \frac{1}{\beta A^2}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]}}\; e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} + \text{TAN}^{-1}\frac{\beta}{\mu-\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha}$
Equation 7.5 $\frac{N_6(s)}{s^2(s+\gamma)^2(s+\delta)^2(s+\mu)}$	$\frac{a_0 t + a_1}{\gamma^2\delta^2\mu} - \frac{a_0}{\gamma^2\delta^2\mu}\left[\frac{2}{\gamma}+\frac{2}{\delta}+\frac{1}{\mu}\right] + \frac{(3)e^{-\mu t}}{\mu^2(\gamma-\mu)^2(\delta-\mu)^2}$ $+ \frac{1}{\gamma^2(\delta-\gamma)^2(\mu-\gamma)}\left[(1)t + (18) - (1)\left\{-\frac{2}{\gamma}+\frac{2}{\delta-\gamma}+\frac{1}{\mu-\gamma}\right\}\right]e^{-\gamma t}$ $+ \frac{1}{\delta^2(\gamma-\delta)^2(\mu-\delta)}\left[(2)t + (19) - (2)\left\{-\frac{2}{\delta}+\frac{2}{\gamma-\delta}+\frac{1}{\mu-\delta}\right\}\right]e^{-\delta t}$
Equation 7.6 $\frac{N_6(s)}{s^2(s+\gamma)^2(s+\delta)(s^2+\lambda^2)}$	$\frac{a_0 t + a_1}{\gamma^2\delta\lambda^2} - \frac{a_0}{\gamma^2\delta\lambda^2}\left[\frac{2}{\gamma}+\frac{1}{\delta}\right] + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)^2(\delta^2+\lambda^2)} + \left[\frac{(1)t+(18)}{\gamma^2(\delta-\gamma)(\gamma^2+\lambda^2)}\right.$ $\left. - \frac{(1)}{\gamma^3(\delta-\gamma)(\gamma^2+\lambda^2)}\left\{-\frac{2}{\gamma}+\frac{1}{\delta-\gamma}-\frac{2\gamma}{\gamma^2+\lambda^2}\right\}\right]e^{-\gamma t} - \frac{1}{\lambda^3(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\delta^2+\lambda^2}}\;\cos(\lambda t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{\lambda}{\delta}$

F(s)	f(t)
Equation 7.7 $\frac{N_6(s)}{s^2(s+\gamma)^2(s+\delta)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0 t + a_1}{\gamma^2 \delta A^2} - \frac{a_0}{\gamma^2 \delta A^2}\left[\frac{2}{\gamma} + \frac{1}{\delta} + \frac{2\alpha}{A^2}\right] + \frac{(2)e^{-\delta t}}{\delta^2(\gamma-\delta)^2[(\alpha-\delta)^2+\beta^2]}$ $+ \frac{1}{\gamma^2(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]}\left[(1)t + (18) - (1)\left\{-\frac{2}{\gamma} + \frac{1}{\delta-\gamma} + \frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right] e^{-}$ $+ \frac{1}{\beta A^2[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{(\delta-\alpha)^2+\beta^2}}\; e^{-\alpha t}\cos(\beta t - \psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha}$
Equation 7.8 $\frac{N_6(s)}{s^2(s+\gamma)(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{a_0 t + a_1}{\gamma\lambda^2\epsilon^2} - \frac{a_0}{\gamma^2\lambda^2\epsilon^2} + \frac{(1)e^{-\gamma t}}{\gamma^2(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)}$ $- \frac{1}{\lambda^3(\epsilon^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\cos(\lambda t - \psi_1) - \frac{1}{\epsilon^3(\lambda^2-\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{\gamma^2+\epsilon^2}}\cos(\epsilon t -$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} \qquad \psi_2 = \text{TAN}^{-1}\frac{(8)}{(9)} + \text{TAN}^{-1}\frac{\epsilon}{\gamma}$

F(s)	f(t)
Equation 7.9 $\frac{N_6(s)}{s^2(s+\gamma)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0 t + a_1}{\gamma\lambda^2 A^2} - \frac{a_0}{\gamma\lambda^2 A^2}\left[\frac{1}{\gamma} + \frac{2\alpha}{A^2}\right] + \frac{(1)e^{-\gamma t}}{\gamma^2(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]}$ $- \frac{1}{\lambda^3}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t - \psi_1)$ $+ \frac{1}{\beta A^2}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\, e^{-\alpha t}\cos(\beta t - \psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha} - \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$
Equation 7.10 $\frac{N_6(s)}{s^2(s+\gamma)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{a_0 t + a_1}{\gamma A^2 B^2} - \frac{a_0}{\gamma A^2 B^2}\left[\frac{1}{\gamma} + \frac{2\alpha}{A^2} + \frac{2\sigma}{B^2}\right] + \frac{(1)e^{-\gamma t}}{\gamma^2[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]}$ $+ \frac{1}{\beta A^2}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2+\tau^2-\beta^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\alpha t}\cos(\beta t - \psi_1)$ $+ \frac{1}{\tau B^2}\sqrt{\frac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2]\{[(\sigma-\alpha)^2+\tau^2-\beta^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\sigma t}\cos(\tau t - \psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2+\tau^2-\beta^2} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha}$ $\psi_2 = \text{TAN}^{-1}\frac{(14)}{(15)} + \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2+\beta^2-\tau^2} + \text{TAN}^{-1}\frac{\tau}{\gamma-\sigma} - 2\,\text{TAN}^{-1}\frac{\tau}{\sigma}$

F(s)	f(t)
Equation 7.11 $\frac{N_6(s)}{s^2(s+\gamma)(s^2+\lambda^2)^2}$	$\frac{a_0 t + a_1}{\gamma \lambda^4} - \frac{a_0}{\gamma^2 \lambda^4} + \frac{(1) e^{-\gamma t}}{\gamma^2(\gamma^2+\lambda^2)^2} + \frac{1}{2\lambda^4}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\; t \cos(\lambda t +$ $- \frac{1}{2\lambda^5(\gamma^2+\lambda^2)}\sqrt{(25)^2+(26)^2}\;\cos(\lambda t - \psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\gamma}$ $\psi_2 = \text{TAN}^{-1}\frac{(26)}{(25)} + 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$
Equation 7.12 $\frac{N_6(s)}{s^2(s+\gamma)[(s+\alpha)^2+\beta^2]^2}$	$\frac{a_0 t + a_1}{\gamma A^4} - \frac{a_0}{\gamma A^4}\left[\frac{1}{\gamma} + \frac{4\alpha}{A^2}\right] + \frac{(1) e^{-\gamma t}}{\gamma^2[(\alpha-\gamma)^2+\beta^2]^2}$ $- \frac{1}{2\beta^2 A^2}\sqrt{\frac{(12)^2+(13)^2}{(\gamma-\alpha)^2+\beta^2}}\; t\, e^{-\alpha t}\cos(\beta t + \psi_1)$ $- \frac{1}{2\beta^3 A^3[(\gamma-\alpha)^2+\beta^2]}\sqrt{(27)^2+(28)^2}\; e^{-\alpha t}\cos(\beta t + \psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\alpha}$ $\psi_2 = \text{TAN}^{-1}\frac{(27)}{(28)} - 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\alpha} - 2\,\text{TAN}^{-1}\frac{\alpha}{\beta}$

F(s)	f(t)
Equation 7.13 $\frac{N_6(s)}{s(s+\gamma)^2(s+\delta)(s+\mu)(s+\eta)(s+\rho)}$	$\frac{a_0}{\gamma^2\delta\mu\eta\rho} - \frac{e^{-\gamma t}}{\gamma(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)}\left[(1)t + (18) + (1)\left\{\frac{1}{\gamma} - \frac{1}{\delta-\gamma} - \frac{1}{\mu-\gamma} - \frac{1}{\eta-\gamma} - \frac{1}{\rho-\gamma}\right\}\right]$ $- \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)(\rho-\delta)} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)^2(\delta-\mu)(\eta-\mu)(\rho-\mu)}$ $- \frac{(4)e^{-\eta t}}{\eta(\gamma-\eta)^2(\delta-\eta)(\mu-\eta)(\rho-\eta)} - \frac{(5)e^{-\rho t}}{\rho(\gamma-\rho)^2(\delta-\rho)(\mu-\rho)(\eta-\rho)}$
Equation 7.14 $\frac{N_6(s)}{s(s+\gamma)(s+\delta)(s+\mu)(s+\eta)(s^2+\lambda^2)}$	$\frac{a_0}{\gamma\delta\mu\eta\lambda^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\gamma^2+\lambda^2)}$ $- \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\mu-\delta)(\eta-\delta)(\delta^2+\lambda^2)} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)(\delta-\mu)(\eta-\mu)(\mu^2+\lambda^2)}$ $- \frac{(4)e^{-\eta t}}{\eta(\gamma-\eta)(\delta-\eta)(\mu-\eta)(\eta^2+\lambda^2)}$ $- \frac{1}{\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)(\eta^2+\lambda^2)}}\cos(\lambda t + \psi)$ $\psi = \tan^{-1}\frac{(7)}{(6)} - \tan^{-1}\frac{\lambda}{\gamma} - \tan^{-1}\frac{\lambda}{\delta} - \tan^{-1}\frac{\lambda}{\mu} - \tan^{-1}\frac{\lambda}{\eta}$

F(s)	f(t)
Equation 7.15 $\frac{N_6(s)}{s(s+\gamma)(s+\delta)(s+\mu)(s+\eta)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma\delta\mu\eta A^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)[(\alpha-\gamma)^2+\beta^2]}$ $- \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\mu-\delta)(\eta-\delta)[(\alpha-\delta)^2+\beta^2]} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)(\delta-\mu)(\eta-\mu)[(\alpha-\mu)^2+\beta^2]}$ $- \frac{(4)e^{-\eta t}}{\eta(\gamma-\eta)(\delta-\eta)(\mu-\eta)[(\alpha-\eta)^2+\beta^2]}$ $- \frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2][(\eta-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} - \text{TAN}^{-1}\frac{\beta}{\mu-\alpha} - \text{TAN}^{-1}\frac{\beta}{\eta-\alpha}$
Equation 7.16 $\frac{N_6(s)}{s(s+\gamma)^2(s+\delta)^2(s+\mu)(s+\eta)}$	$\frac{a_0}{\gamma^2\delta^2\mu\eta} - \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)^2(\delta-\mu)^2(\eta-\mu)} - \frac{(4)e^{-\eta t}}{\eta(\gamma-\eta)^2(\delta-\eta)^2(\mu-\eta)}$ $- \frac{1}{\gamma(\delta-\gamma)^2(\mu-\gamma)(\eta-\gamma)}\left[(1)t + (18) - (1)\left\{-\frac{1}{\gamma} + \frac{2}{\delta-\gamma} + \frac{1}{\mu-\gamma} + \frac{1}{\eta-\gamma}\right\}\right]$ $- \frac{1}{\delta(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)}\left[(2)t + (19) - (2)\left\{-\frac{1}{\delta} + \frac{2}{\gamma-\delta} + \frac{1}{\mu-\delta} + \frac{1}{\eta-\delta}\right\}\right] e$

F(s)	f(t)
Equation 7.17 $\frac{N_6(s)}{s(s+\gamma)^2(s+\delta)(s+\mu)(s^2+\lambda^2)}$	$\frac{a_0}{\gamma^2\delta\mu\lambda^2} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)^2(\mu-\delta)(\delta^2+\lambda^2)}$ $- \frac{1}{\gamma(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)}\left[(1)t+(18)-(1)\left\{-\frac{1}{\gamma}+\frac{1}{\delta-\gamma}+\frac{1}{\mu-\gamma}-\frac{2\gamma}{\gamma^2+\lambda^2}\right\}\right]e^{-\gamma t}$ $- \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)^2(\delta-\mu)(\mu^2+\lambda^2)}$ $- \frac{1}{\lambda^2(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(\delta^2+\lambda^2)(\mu^2+\lambda^2)}}\cos(\lambda t+\psi)$ $\psi = \text{TAN}^{-1}\frac{(7)}{(6)} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma} - \text{TAN}^{-1}\frac{\lambda}{\delta} - \text{TAN}^{-1}\frac{\lambda}{\mu}$
Equation 7.18 $\frac{N_6(s)}{s(s+\gamma)^2(s+\delta)(s+\mu)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma^2\delta\mu A^2} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)^2(\mu-\delta)[(\alpha-\delta)^2+\beta^2]}$ $- \frac{1}{\gamma(\delta-\gamma)(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2]}\left[(1)t+(18)-(1)\left\{-\frac{1}{\gamma}+\frac{1}{\delta-\gamma}+\frac{1}{\mu-\gamma}+\frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right]e^{-\gamma t}$ $- \frac{(3)e^{-\mu t}}{\mu(\gamma-\mu)^2(\delta-\mu)[(\alpha-\mu)^2+\beta^2]}$ $- \frac{1}{\beta A[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{[(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]}}\,e^{-\alpha t}\cos(\beta t+\psi.$ $\psi = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} - \text{TAN}^{-1}\frac{\beta}{\mu-\alpha}$

F(s)	f(t)
Equation 7.19 $\frac{N_6(s)}{s(s+\gamma)(s+\delta)(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{a_0}{\gamma\delta\lambda^2\epsilon^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\delta^2+\lambda^2)(\delta^2+\epsilon^2)}$ $- \frac{1}{\lambda^2(\epsilon^2-\lambda^2)} \sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}} \cos(\lambda t + \psi_1)$ $- \frac{1}{\epsilon^2(\lambda^2-\epsilon^2)} \sqrt{\frac{(8)^2+(9)^2}{(\gamma^2+\epsilon^2)(\delta^2+\epsilon^2)}} \cos(\epsilon t + \psi_2)$ $\psi_1 = \tan^{-1}\frac{(7)}{(6)} - \tan^{-1}\frac{\lambda}{\gamma} - \tan^{-1}\frac{\lambda}{\delta}$ $\psi_2 = \tan^{-1}\frac{(9)}{(8)} - \tan^{-1}\frac{\epsilon}{\gamma} - \tan^{-1}\frac{\epsilon}{\delta}$
Equation 7.20 $\frac{N_6(s)}{s(s+\gamma)(s+\delta)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma\delta\lambda^2A^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\delta^2+\lambda^2)[(\alpha-\delta)^2+\beta^2]}$ $- \frac{1}{\lambda^2} \sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}} \cos(\lambda t + \psi_1)$ $- \frac{1}{\beta A} \sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}} e^{-\alpha t}\cos(\beta t + \psi_2)$ $\psi_1 = \tan^{-1}\frac{(7)}{(6)} - \tan^{-1}\frac{\lambda}{\gamma} - \tan^{-1}\frac{\lambda}{\delta} - \tan^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \tan^{-1}\frac{(13)}{(12)} - \tan^{-1}\frac{\alpha}{\beta} - \tan^{-1}\frac{\beta}{\gamma-\alpha} - \tan^{-1}\frac{\beta}{\delta-\alpha} + \tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+}$

F(s)	f(t)
Equation 7.21 $\frac{N_6(s)}{s(s+\gamma)(s+\delta)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{a_0}{\gamma\delta A^2 B^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)[(\alpha-\delta)^2+\beta^2][(\sigma-\delta)^2+\tau^2]}$ $-\frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $-\frac{1}{\tau B}\sqrt{\frac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2][(\delta-\sigma)^2+\tau^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\sigma t}\cos(\tau t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} - \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(15)}{(14)} - \text{TAN}^{-1}\frac{\sigma}{\tau} - \text{TAN}^{-1}\frac{\tau}{\gamma-\sigma} - \text{TAN}^{-1}\frac{\tau}{\delta-\sigma} - \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$
Equation 7.22 $\frac{N_6(s)}{s(s+\gamma)(s+\delta)(s^2+\lambda^2)^2}$	$\frac{a_0}{\gamma\delta A^4} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)(\gamma^2+\lambda^2)^2} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)(\delta^2+\lambda^2)^2} - \frac{1}{2\lambda^3}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}}\, t\cos(\lambda t-\psi_1)$ $-\frac{1}{2\lambda^4(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}\sqrt{(29)^2+(30)^2}\cos(\lambda t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{\lambda}{\delta}$ $\psi_2 = \text{TAN}^{-1}\frac{(30)}{(29)} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma} - 2\,\text{TAN}^{-1}\frac{\lambda}{\delta}$

F(s)	f(t)
Equation 7.23 $\frac{N_6(s)}{s(s+\gamma)(s+\delta)[(s+\alpha)^2+\beta^2]^2}$	$\frac{a_0}{\gamma\delta A^2} - \frac{(1)e^{-\gamma t}}{\gamma(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]^2} - \frac{(2)e^{-\delta t}}{\delta(\gamma-\delta)[(\alpha-\delta)^2+\beta^2]^2}$ $- \frac{1}{2\beta^2 A}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}}\; t\, e^{-\alpha t}\cos(\beta t-\psi_1)$ $+ \frac{1}{2\beta^3 A^2[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}\sqrt{(31)^2+(32)^2}\; e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\alpha}{\beta} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha}$ $\psi_2 = \text{TAN}^{-1}\frac{(32)}{(31)} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\delta-\alpha}$
Equation 7.24 $\frac{N_6(s)}{s(s+\gamma)^2(s+\delta)^2(s+\mu)^2}$	$\frac{a_0}{\gamma^2\delta^2\mu^2}$ $-\frac{1}{\gamma(\delta-\gamma)^2(\mu-\gamma)^2}\left[(1)t+(18)-(1)\left\{-\frac{1}{\gamma}+\frac{2}{\delta-\gamma}+\frac{2}{\mu-\gamma}\right\}\right]e^{-\gamma t}$ $-\frac{1}{\delta(\gamma-\delta)^2(\mu-\delta)^2}\left[(2)t+(19)-(2)\left\{-\frac{1}{\delta}+\frac{2}{\gamma-\delta}+\frac{2}{\mu-\delta}\right\}\right]e^{-\delta t}$ $-\frac{1}{\mu(\gamma-\mu)^2(\delta-\mu)^2}\left[(3)t+(20)-(3)\left\{-\frac{1}{\mu}+\frac{2}{\gamma-\mu}+\frac{2}{\delta-\mu}\right\}\right]e^{-\mu t}$

F(s)	f(t)
Equation 7.25 $\frac{N_6(s)}{s(s+\gamma)^2(s+\delta)^2(s^2+\lambda^2)}$	$\frac{a_0}{\gamma^2\delta^2\lambda^2} - \frac{1}{\lambda^2(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}\sqrt{(6)^2+(7)^2}\cos(\lambda t+\psi)$ $-\frac{1}{\gamma(\delta-\gamma)^2(\gamma^2+\lambda^2)}\left[(1)t-(18)+(1)\left\{-\frac{1}{\gamma}+\frac{2}{\delta-\gamma}-\frac{2\gamma}{\gamma^2+\lambda^2}\right\}\right]e^{-\gamma t}$ $-\frac{1}{\delta(\gamma-\delta)^2(\delta^2+\lambda^2)}\left[(2)t-(19)+(2)\left\{-\frac{1}{\delta}+\frac{2}{\gamma-\delta}-\frac{2\delta}{\delta^2+\lambda^2}\right\}\right]e^{-\delta t}$ $\psi = \text{TAN}^{-1}\frac{(7)}{(6)} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma} - 2\,\text{TAN}^{-1}\frac{\lambda}{\delta}$
Equation 7.26 $\frac{N_6(s)}{s(s+\gamma)^2(s+\delta)^2[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma^2\delta^2A^2} - \frac{1}{\gamma(\delta-\gamma)^2[(\alpha-\gamma)^2+\beta^2]}\left[(1)t-(18)+(1)\left\{-\frac{1}{\gamma}+\frac{2}{\delta-\gamma}+\frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right]e^{-\gamma t}$ $-\frac{1}{\delta(\gamma-\delta)^2[(\alpha-\delta)^2+\beta^2]}\left[(2)t-(19)+(2)\left\{-\frac{1}{\delta}+\frac{2}{\gamma-\delta}+\frac{2(\alpha-\delta)}{(\alpha-\delta)^2+\beta^2}\right\}\right]e^{-\delta t}$ $-\frac{1}{\beta A[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}\sqrt{(12)^2+(13)^2}\,e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} - \text{TAN}^{-1}\frac{\beta}{\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\delta-\alpha}$

F(s)	f(t)
Equation 7.27 $\frac{N_6(s)}{s(s+\gamma)^2(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{a_0}{\gamma^2\lambda^2\epsilon^2} - \frac{1}{\gamma(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)}\left[(1)t - (18) + (1)\left\{-\frac{1}{\gamma} - \frac{2\gamma}{\gamma^2+\lambda^2} - \frac{2\gamma}{\gamma^2+\epsilon^2}\right\}\right] e^{-\gamma t}$ $- \frac{1}{\lambda^2(\gamma^2+\lambda^2)(\epsilon^2-\lambda^2)}\sqrt{(6)^2+(7)^2}\cos(\lambda t+\psi_1)$ $- \frac{1}{\epsilon^2(\gamma^2+\epsilon^2)(\lambda^2-\epsilon^2)}\sqrt{(8)^2+(9)^2}\cos(\epsilon t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$ $\qquad$ $\psi_2 = \text{TAN}^{-1}\frac{(9)}{(8)} - 2\,\text{TAN}^{-1}\frac{\epsilon}{\gamma}$
Equation 7.28 $\frac{N_6(s)}{s(s+\gamma)^2(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\gamma^2\lambda^2A^2} - \frac{1}{\gamma(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]}\left[(1)t - (18) + (1)\left\{-\frac{1}{\gamma} - \frac{2\gamma}{\gamma^2+\lambda^2} + \frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right] e^{-\gamma t}$ $- \frac{1}{\lambda^2(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t+\psi_1)$ $- \frac{1}{\beta A[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\, e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma} - \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(12)}{(13)} - \text{TAN}^{-1}\frac{\beta}{\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)
Equation 7.29 $\frac{N_6(s)}{s(s+\gamma)^2[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{a_0}{\gamma^2 A^2 B^2} - \frac{1}{\gamma[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]}\left[(1)t-(18)+(1)\left\{-\frac{1}{\gamma}+\frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}+\frac{2(\sigma-\gamma)}{(\sigma-\gamma)^2+\tau^2}\right\}\right]e^{-\gamma t}$ $-\frac{1}{\beta A[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\;e^{-\alpha t}\cos(\beta t-\psi_1)$ $-\frac{1}{\tau B[(\gamma-\sigma)^2+\tau^2]}\sqrt{\frac{(14)^2+(15)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\;e^{-\sigma t}\cos(\tau t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(12)}{(13)} - \text{TAN}^{-1}\frac{\beta}{\alpha} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(14)}{(15)} - \text{TAN}^{-1}\frac{\tau}{\sigma} + 2\,\text{TAN}^{-1}\frac{\tau}{\gamma-\sigma} + \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$
Equation 7.30 $\frac{N_6(s)}{s(s+\gamma)^2(s^2+\lambda^2)^2}$	$\frac{a_0}{\gamma^2\lambda^4} - \frac{1}{\gamma(\gamma^2+\lambda^2)^2}\left[(1)t-(18)+(1)\left\{-\frac{1}{\gamma}-\frac{4\gamma}{\gamma^2+\lambda^2}\right\}\right]e^{-\gamma t}$ $-\frac{1}{2\lambda^3(\gamma^2+\lambda^2)}\sqrt{(6)^2+(7)^2}\;t\cos(\lambda t-\psi_1)$ $-\frac{1}{2\lambda^4(\gamma^2+\lambda^2)}\sqrt{\frac{(33)^2+(34)^2}{\gamma^2+\lambda^2}}\cos(\lambda t+\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$ $\psi_2 = \text{TAN}^{-1}\frac{(34)}{(33)} - 3\,\text{TAN}^{-1}\frac{\lambda}{\gamma}$

F(s)	f(t)
Equation 7.31 $\frac{N_6(s)}{s(s+\gamma)^2[(s+\alpha)^2+\beta^2]^2}$	$\frac{a_0}{\gamma^2 A^4} - \frac{1}{\gamma[(\alpha-\gamma)^2+\beta^2]^2}\left[(1)t - (18) + (1)\left\{-\frac{1}{\gamma} + \frac{4(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right] e^{-\gamma t}$ $- \frac{1}{2\beta^2[(\gamma-\alpha)^2+\beta^2]A}\sqrt{(12)^2+(13)^2}\; t\, e^{-\alpha t}\cos(\beta t - \psi_1)$ $+ \frac{1}{2\beta^3 A^2[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(35)^2+(36)^2}{(\gamma-\alpha)^2+\beta^2}}\; e^{-\alpha t}\cos(\beta t - \psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\alpha}{\beta} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$ $\psi_2 = \text{TAN}^{-1}\frac{(36)}{(35)} - 2\,\text{TAN}^{-1}\frac{\beta}{\alpha} + 3\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$
Equation 7.32 $\frac{N_6(s)}{s(s^2+\lambda^2)(s^2+\epsilon^2)(s^2+k^2)}$	$\frac{a_0}{\lambda^2\epsilon^2 k^2} - \frac{1}{\lambda^2(\epsilon^2-\lambda^2)(k^2-\lambda^2)}\sqrt{(6)^2+(7)^2}\cos(\lambda t + \psi_1)$ $- \frac{1}{\epsilon^2(\lambda^2-\epsilon^2)(k^2-\epsilon^2)}\sqrt{(8)^2+(9)^2}\cos(\epsilon t + \psi_2)$ $- \frac{1}{k^2(\lambda^2-k^2)(\epsilon^2-k^2)}\sqrt{(10)^2+(11)^2}\cos(k t + \psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} \qquad \psi_2 = \text{TAN}^{-1}\frac{(9)}{(8)} \qquad \psi_3 = \text{TAN}^{-1}\frac{(11)}{(10)}$

F(s)	f(t)
Equation 7.33 $\frac{N_6(s)}{s(s^2+\lambda^2)(s^2+\epsilon^2)[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\lambda^2\epsilon^2A^2} - \frac{1}{\lambda^2(\epsilon^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\cos(\lambda t+\psi_1)$ $-\frac{1}{\epsilon^2(\lambda^2-\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{(A^2-\epsilon^2)^2+4\alpha^2\epsilon^2}}\cos(\epsilon t+\psi_2)$ $-\frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{[(A^2-\lambda^2)^2+4\alpha^2\lambda^2][(A^2-\epsilon^2)^2+4\alpha^2\epsilon^2]}}e^{-\alpha t}\cos(\beta t-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(9)}{(8)} - \text{TAN}^{-1}\frac{2\alpha\epsilon}{A^2-\epsilon^2}$ $\psi_3 = \text{TAN}^{-1}\frac{(12)}{(13)} - \text{TAN}^{-1}\frac{\beta}{\alpha} - \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2} - \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\epsilon^2}$
Equation 7.34 $\frac{N_6(s)}{s(s^2+\lambda^2)^2[(s+\alpha)^2+\beta^2]}$	$\frac{a_0}{\lambda^4A^2} - \frac{1}{2\lambda^3}\sqrt{\frac{(6)^2+(7)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\,t\cos(\lambda t-\psi_1)$ $-\frac{1}{2\lambda^4[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(37)^2+(38)^2}\cos(\lambda t-\psi_2)$ $-\frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}e^{-\alpha t}\cos(\beta t-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(38)}{(37)} + 2\,\text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_3 = \text{TAN}^{-1}\frac{(12)}{(13)} - \text{TAN}^{-1}\frac{\beta}{\alpha} - \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)
Equation 7.35 $\frac{N_6(s)}{s(s^2+\lambda^2)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{a_0}{\lambda^2 A^2 B^2} - \frac{1}{\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{[(A^2-\lambda^2)^2+4\alpha^2\lambda^2][(B^2-\lambda^2)^2+4\sigma^2\lambda^2]}}\cos(\lambda t+\psi_1)$ $-\frac{1}{\beta A}\sqrt{\frac{(12)^2+(13)^2}{[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]\{[(\sigma-\alpha)^2+\beta^2-\tau^2]^2+4\tau^2(\sigma-\alpha)^2\}}}e^{-\alpha t}\cos(\beta t+\psi_2)$ $-\frac{1}{\tau B}\sqrt{\frac{(14)^2+(15)^2}{[(B^2-\lambda^2)^2+4\sigma^2\lambda^2]\{[(\sigma-\alpha)^2+\beta^2-\tau^2]^2+4\tau^2(\sigma-\alpha)^2\}}}e^{-\sigma t}\cos(\tau t+\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2} - \text{TAN}^{-1}\frac{2\sigma\lambda}{B^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\alpha}{\beta} + \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2} - \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+}$ $\psi_3 = \text{TAN}^{-1}\frac{(15)}{(14)} - \text{TAN}^{-1}\frac{\sigma}{\tau} + \text{TAN}^{-1}\frac{2\sigma\tau}{\sigma^2-\tau^2+\lambda^2} - \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$
Equation 7.36 $\frac{N_6(s)}{s(s^2+\lambda^2)^2(s^2+\epsilon^2)}$	$\frac{a_0}{\lambda^4\epsilon^2} - \frac{1}{2\lambda^3(\epsilon^2-\lambda^2)}\sqrt{(6)^2+(7)^2}\ t\cos(\lambda t-\psi_1)$ $-\frac{1}{2\lambda^4(\epsilon^2-\lambda^2)^2}\sqrt{(39)^2+(40)^2}\cos(\lambda t-\psi_2)$ $-\frac{1}{\epsilon^2(\lambda^2-\epsilon^2)^2}\sqrt{(8)^2+(9)^2}\cos(\epsilon t+\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} \qquad \psi_2 = \text{TAN}^{-1}\frac{(40)}{(39)} \qquad \psi_3 = \text{TAN}^{-1}\frac{(9)}{(8)}$

F(s)	f(t)
Equation 7.37 $\frac{N_6(s)}{s(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]^2}$	$\frac{a_0}{\lambda^2 A^4} - \frac{1}{\lambda^2[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(6)^2+(7)^2}\cos(\lambda t+\psi_1) - \frac{1}{2\beta^2 A}\sqrt{\frac{(12)^2+(13)^2}{(A^2-\lambda^2)^2+4\alpha^2\lambda^2}}\, t e^{-\alpha t}\cos(\beta t+\psi_2)$ $+\frac{1}{2\beta^3 A^2[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(41)^2+(42)^2}\, e^{-\alpha t}\cos(\beta t-\psi_3)$ $\psi_1 = \tan^{-1}\frac{(7)}{(6)} - 2\tan^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \tan^{-1}\frac{(13)}{(12)} + \tan^{-1}\frac{\beta}{\alpha} + \tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$ $\psi_3 = \tan^{-1}\frac{(42)}{(41)} - 2\tan^{-1}\frac{\beta}{\alpha} + 2\tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$
Equation 7.38 $\frac{N_6(s)}{s[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2][(s+\zeta)^2+\varphi^2]}$	$\frac{a_0}{A^2B^2C^2} - \frac{1}{\rho A}\sqrt{\frac{(12)^2+(13)^2}{\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}\{[(\zeta-\alpha)^2-\beta^2+\varphi^2]^2+4\beta^2(\zeta-\alpha)^2\}}}\, e^{-\alpha t}\cos(\beta t-\psi_1)$ $-\frac{1}{\tau B}\sqrt{\frac{(14)^2+(15)^2}{\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}\{[(\zeta-\sigma)^2-\tau^2+\varphi^2]^2+4\tau^2(\zeta-\sigma)^2\}}}\, e^{-\sigma t}\cos(\tau t-\psi_2) - \frac{1}{\varphi C}\sqrt{\frac{(16)^2+(17)^2}{\{[(\zeta-\alpha)^2-\beta^2+\varphi^2]^2+4\beta^2(\zeta-\alpha)^2\}\{[(\zeta-\sigma)^2-\tau^2+\varphi^2]^2+4\tau^2(\zeta-\sigma)^2\}}}\, e^{-\zeta t}\cos(\varphi t-\psi_3)$ $\psi_1 = \tan^{-1}\frac{(12)}{(13)} - \tan^{-1}\frac{\beta}{\alpha} + \tan^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2} + \tan^{-1}\frac{2\beta(\zeta-\alpha)}{(\zeta-\alpha)^2-\beta^2+\varphi^2}$ $\psi_2 = \tan^{-1}\frac{(14)}{(15)} - \tan^{-1}\frac{\tau}{\sigma} + \tan^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2} + \tan^{-1}\frac{2\tau(\zeta-\sigma)}{(\zeta-\sigma)^2-\tau^2+\varphi^2}$ $\psi_3 = \tan^{-1}\frac{(16)}{(17)} - \tan^{-1}\frac{\varphi}{\zeta} + \tan^{-1}\frac{2\varphi(\sigma-\zeta)}{(\sigma-\zeta)^2-\varphi^2+\tau^2} + \tan^{-1}\frac{2\varphi(\alpha-\zeta)}{(\alpha-\zeta)^2-\varphi^2+\beta^2}$

F(s)	f(t)
Equation 7.39 $\frac{N_6(s)}{s[(s+\alpha)^2+\beta^2]^2[(s+\sigma)^2+\tau^2]}$	$\frac{a_0}{A^2B^2} + \frac{1}{2\beta^2 A}\sqrt{\frac{(12)^2+(13)^2}{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2}}\, e^{-\alpha t}\cos(\beta t+\psi_1)$ $+\frac{1}{2\beta^3A^2\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2-4\beta^2(\sigma-\alpha)^2\}}\sqrt{(43)^2+(44)^2}\, e^{-\alpha t}\cos(\beta t-\psi_2)$ $-\frac{1}{\tau B\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2-4\beta^2(\sigma-\alpha)^2\}}\sqrt{(14)^2+(15)^2}\, e^{-\sigma t}\cos(\tau t+\psi_3)$ $\psi_1 = \tan^{-1}\frac{(13)}{(12)}+\tan^{-1}\frac{\beta}{\alpha}-\tan^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_2 = \tan^{-1}\frac{(44)}{(43)}-2\tan^{-1}\frac{\beta}{\alpha}+2\tan^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_3 = \tan^{-1}\frac{(15)}{(14)}-\tan^{-1}\frac{\sigma}{\tau}-2\tan^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$
Equation 7.40 $\frac{N_6(s)}{(s+\gamma)(s+\delta)(s+\mu)(s+\eta)(s+\rho)(s^2+\lambda^2)}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)(\gamma^2+\lambda^2)}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\eta-\delta)(\rho-\delta)(\delta^2+\lambda^2)}+\frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\eta-\mu)(\rho-\mu)(\mu^2+\lambda^2)}+$ $\frac{(4)e^{-\eta t}}{(\delta-\eta)(\gamma-\eta)(\mu-\eta)(\rho-\eta)(\eta^2+\lambda^2)}+\frac{(5)e^{-\rho t}}{(\gamma-\rho)(\delta-\rho)(\mu-\rho)(\eta-\rho)(\rho^2+\lambda^2)}+\frac{1}{\lambda}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)(\eta^2+\lambda^2)(\rho^2+\lambda^2)}}\cos(\lambda t-\psi)$ $\psi = \tan^{-1}\frac{(6)}{(7)}+\tan^{-1}\frac{\lambda}{\gamma}+\tan^{-1}\frac{\lambda}{\delta}+\tan^{-1}\frac{\lambda}{\mu}+\tan^{-1}\frac{\lambda}{\eta}+\tan^{-1}\frac{\lambda}{\rho}$

F(s)	f(t)
Equation 7.41 $\frac{N_6(s)}{(s+\gamma)(s+\delta)(s+\mu)(s+\eta)(s+\rho)[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)[(\alpha-\gamma)^2+\beta^2]} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\eta-\delta)(\rho-\delta)[(\alpha-\delta)^2+\beta^2]} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\eta-\mu)(\rho-\mu)[(\alpha-\mu)^2+\beta^2]} +$ $\frac{(4)e^{-\eta t}}{(\gamma-\eta)(\delta-\eta)(\mu-\eta)(\rho-\eta)[(\alpha-\eta)^2+\beta^2]} + \frac{(5)e^{-\rho t}}{(\gamma-\rho)(\delta-\rho)(\mu-\rho)(\eta-\rho)[(\alpha-\rho)^2+\beta^2]} +$ $\frac{1}{\beta}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2][(\eta-\alpha)^2+\beta^2][(\rho-\alpha)^2+\beta^2]}}\, e^{-\alpha t}\cos(\beta t-\psi)$ $\psi = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} + \text{TAN}^{-1}\frac{\beta}{\mu-\alpha} + \text{TAN}^{-1}\frac{\beta}{\eta-\alpha} + \text{TAN}^{-1}\frac{\beta}{\rho-\alpha}$
Equation 7.42 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)^2(s+\mu)(s+\eta)(s+\rho)}$	$\frac{1}{(\delta-\gamma)^2(\mu-\gamma)(\eta-\gamma)(\rho-\gamma)}\left[(1)t+(18)-(1)\left\{\frac{2}{\delta-\gamma}+\frac{1}{\mu-\gamma}+\frac{1}{\eta-\gamma}+\frac{1}{\rho-\gamma}\right\}\right]e^{-\gamma t} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)^2(\eta-\mu)(\rho-\mu)}$ $+\frac{1}{(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)(\rho-\delta)}\left[(2)t+(19)-(2)\left\{\frac{2}{\gamma-\delta}+\frac{1}{\mu-\delta}+\frac{1}{\eta-\delta}+\frac{1}{\rho-\delta}\right\}\right]e^{-\delta t} + \frac{(4)e^{-\eta t}}{(\gamma-\eta)^2(\delta-\eta)^2(\mu-\eta)(\rho-\eta)}$ $+\frac{(5)e^{-\rho t}}{(\gamma-\rho)^2(\delta-\rho)^2(\mu-\rho)(\eta-\rho)}$

F(s)	f(t)
Equation 7.43 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)(s+\mu)(s+\eta)(s^2+\lambda^2)}$	$\frac{1}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)(\gamma^2+\lambda^2)}\left[(1)t+(18)-(1)\left\{\frac{1}{\delta-\gamma}+\frac{1}{\mu-\gamma}+\frac{1}{\eta-\gamma}-\frac{2\gamma}{\gamma^2+\lambda^2}\right\}\right]e^{-\gamma t}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)(\delta^2+\lambda^2)}$ $+\frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)(\eta-\mu)(\mu^2+\lambda^2)}+\frac{(4)e^{-\eta t}}{(\gamma-\eta)^2(\delta-\eta)(\mu-\eta)(\eta^2+\lambda^2)}+\frac{1}{\lambda(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(\delta^2+\lambda^2)(\mu^2+\lambda^2)(\eta^2+\lambda^2)}}\cos(\lambda t-\psi)$ $\psi=\tan^{-1}\frac{(6)}{(7)}+2\tan^{-1}\frac{\lambda}{\gamma}+\tan^{-1}\frac{\lambda}{\delta}+\tan^{-1}\frac{\lambda}{\mu}+\tan^{-1}\frac{\lambda}{\eta}$
Equation 7.44 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)(s+\mu)(s+\eta)[(s+\alpha)^2+\beta^2]}$	$\frac{1}{(\delta-\gamma)(\mu-\gamma)(\eta-\gamma)[(\alpha-\gamma)^2+\beta^2]}\left[(1)t+(18)-(1)\left\{\frac{1}{\delta-\gamma}+\frac{1}{\mu-\gamma}+\frac{1}{\eta-\gamma}+\frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right]e^{-\gamma t}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\mu-\delta)(\eta-\delta)[(\alpha-\delta)^2+\beta^2]}$ $+\frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)(\eta-\mu)[(\alpha-\mu)^2+\beta^2]}+\frac{(4)e^{-\eta t}}{(\gamma-\eta)^2(\delta-\eta)(\mu-\eta)[(\alpha-\eta)^2+\beta^2]}$ $+\frac{1}{\beta[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{[(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2][(\eta-\alpha)^2+\beta^2]}}e^{-\alpha t}\cos(\beta t-\psi)$ $\psi=\tan^{-1}\frac{(12)}{(13)}+2\tan^{-1}\frac{\beta}{\gamma-\alpha}+\tan^{-1}\frac{\beta}{\delta-\alpha}+\tan^{-1}\frac{\beta}{\mu-\alpha}+\tan^{-1}\frac{\beta}{\eta-\alpha}$

F(s)	f(t)
Equation 7.45 $\frac{N_6(s)}{(s+\gamma)(s+\delta)(s+\mu)(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\delta^2+\lambda^2)(\delta^2+\epsilon^2)} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\mu^2+\lambda^2)(\mu^2+\epsilon^2)}$ $+\frac{1}{\lambda(\epsilon^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)}}\cos(\lambda t-\psi_1) + \frac{1}{\epsilon(\lambda^2-\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{(\gamma^2+\epsilon^2)(\delta^2+\epsilon^2)(\mu^2+\epsilon^2)}}\cos(\epsilon t-\psi_2)$ $\psi_1 = \tan^{-1}\frac{(6)}{(7)} + \tan^{-1}\frac{\lambda}{\gamma} + \tan^{-1}\frac{\lambda}{\delta} + \tan^{-1}\frac{\lambda}{\mu}$ $\quad \psi_2 = \tan^{-1}\frac{(8)}{(9)} + \tan^{-1}\frac{\epsilon}{\gamma} + \tan^{-1}\frac{\epsilon}{\delta} + \tan^{-1}\frac{\epsilon}{\mu}$
Equation 7.46 $\frac{N_6(s)}{(s+\gamma)(s+\delta)(s+\mu)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\delta^2+\lambda^2)[(\alpha-\delta)^2+\beta^2]} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\mu^2+\lambda^2)[(\alpha-\mu)^2+\beta^2]}$ $+\frac{1}{\lambda}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $+\frac{1}{\beta}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1 = \tan^{-1}\frac{(6)}{(7)} + \tan^{-1}\frac{\lambda}{\gamma} + \tan^{-1}\frac{\lambda}{\delta} + \tan^{-1}\frac{\lambda}{\mu} + \tan^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\quad \psi_2 = \tan^{-1}\frac{(12)}{(13)} + \tan^{-1}\frac{\beta}{\gamma-\alpha} + \tan^{-1}\frac{\beta}{\delta-\alpha} + \tan^{-1}\frac{\beta}{\mu-\alpha} + \tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)
Equation 7.47 $\frac{N_6(s)}{(s+\gamma)(s+\delta)(s+\mu)(s^2+\lambda^2)^2}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)(\gamma^2+\lambda^2)^2} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)(\delta^2+\lambda^2)^2} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)(\mu^2+\lambda^2)^2} - \frac{1}{2\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)}}\, t\cos(\lambda t+\psi_1)$ $+ \frac{1}{2\lambda^3(\gamma^2+\lambda^2)(\delta^2+\lambda^2)(\mu^2+\lambda^2)}\sqrt{(45)^2+(46)^2}\cos(\lambda t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\gamma} - \text{TAN}^{-1}\frac{\lambda}{\delta} - \text{TAN}^{-1}\frac{\lambda}{\mu} \qquad \psi_2 = \text{TAN}^{-1}\frac{(46)}{(45)} + 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma} + 2\,\text{TAN}^{-1}\frac{\lambda}{\delta} + 2\,\text{TAN}^{-1}\frac{\lambda}{\mu}$
Equation 7.48 $\frac{N_6(s)}{(s+\gamma)(s+\delta)(s+\mu)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)[(\alpha-\delta)^2+\beta^2][(\sigma-\delta)^2+\tau^2]} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)[(\alpha-\mu)^2+\beta^2][(\sigma-\mu)^2+\tau^2]}$ $+\frac{1}{\beta}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\alpha t}\cos(\beta t-\psi_1)$ $+\frac{1}{\tau}\sqrt{\frac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2][(\delta-\sigma)^2+\tau^2][(\mu-\sigma)^2+\tau^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\, e^{-\sigma t}\cos(\tau t-\psi_2)$ $\psi_1 = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + \text{TAN}^{-1}\frac{\beta}{\delta-\alpha} + \text{TAN}^{-1}\frac{\beta}{\mu-\alpha} + \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2} \qquad \psi_2 = \text{TAN}^{-1}\frac{(14)}{(15)} + \text{TAN}^{-1}\frac{\tau}{\gamma-\sigma} + \text{TAN}^{-1}\frac{\tau}{\delta-\sigma} + \text{TAN}^{-1}\frac{\tau}{\mu-\sigma} + \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$

F(s)	f(t)
Equation 7.49 $\frac{N_c(s)}{(s+\gamma)(s+\delta)(s+\mu)[(s+\alpha)^2+\beta^2]^2}$	$\frac{(1)e^{-\gamma t}}{(\delta-\gamma)(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2]^2} + \frac{(2)e^{-\delta t}}{(\gamma-\delta)(\mu-\delta)[(\alpha-\delta)^2+\beta^2]^2} + \frac{(3)e^{-\mu t}}{(\gamma-\mu)(\delta-\mu)[(\alpha-\mu)^2+\beta^2]^2}$ $-\frac{1}{2\beta^2}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]}}\, t e^{-\alpha t}\cos(\beta t+\psi_1)$ $\qquad \psi_1 = \tan^{-1}\frac{(13)}{(12)} - \tan^{-1}\frac{\beta}{\gamma-\alpha} - \tan^{-1}\frac{\beta}{\delta-\alpha} - \tan^{-1}\frac{\beta}{\mu-\alpha}$ $+\frac{1}{2\beta^3[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2][(\mu-\alpha)^2+\beta^2]}\sqrt{(47)^2+(48)^2}\, e^{-\alpha t}\cos(\beta t-\psi_2)$ $\qquad \psi_2 = \tan^{-1}\frac{(48)}{(47)} + 2\tan^{-1}\frac{\beta}{\gamma-\alpha} + 2\tan^{-1}\frac{\beta}{\delta-\alpha} + 2\tan^{-1}\frac{\beta}{\mu-\alpha}$
Equation 7.50 $\frac{N_c(s)}{(s+\gamma)^2(s+\delta)^2(s+\mu)^2(s+\eta)}$	$\frac{1}{(\delta-\gamma)^2(\mu-\gamma)^2(\eta-\gamma)}\left[(1)t+(18)-(1)\left\{\frac{2}{\delta-\gamma}+\frac{2}{\mu-\gamma}+\frac{1}{\eta-\gamma}\right\}\right]e^{-\gamma t}$ $+\frac{1}{(\gamma-\delta)^2(\mu-\delta)^2(\eta-\delta)}\left[(2)t+(19)-(2)\left\{\frac{2}{\gamma-\delta}+\frac{2}{\mu-\delta}+\frac{1}{\eta-\delta}\right\}\right]e^{-\delta t}$ $+\frac{1}{(\gamma-\mu)^2(\delta-\mu)^2(\eta-\mu)}\left[(3)t+(20)-(3)\left\{\frac{2}{\gamma-\mu}+\frac{2}{\delta-\mu}+\frac{1}{\eta-\mu}\right\}\right]e^{-\mu t}$ $+\frac{(4)e^{-\eta t}}{(\gamma-\eta)^2(\delta-\eta)^2(\mu-\eta)^2}$

F(s)	f(t)
Equation 7.51 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)^2(s+\mu)(s^2+\lambda^2)}$	$\frac{1}{(\delta-\gamma)^2(\mu-\gamma)(\gamma^2+\lambda^2)}\left[(1)t+(18)-(1)\left\{\frac{2}{\delta-\gamma}+\frac{1}{\mu-\gamma}-\frac{2\gamma}{\gamma^2+\lambda^2}\right\}\right]e^{-\gamma t}+\frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)^2(\mu^2+\lambda^2)}$ $+\frac{1}{(\gamma-\delta)^2(\mu-\delta)(\delta^2+\lambda^2)}\left[(2)t+(19)-(2)\left\{\frac{2}{\gamma-\delta}+\frac{1}{\mu-\delta}-\frac{2\delta}{\delta^2+\lambda^2}\right\}\right]e^{-\delta t}+\frac{1}{\lambda(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\mu^2+\lambda^2}}\cos(\lambda t-\psi)$ $\psi=\tan^{-1}\frac{(6)}{(7)}+2\tan^{-1}\frac{\lambda}{\gamma}+2\tan^{-1}\frac{\lambda}{\delta}+\tan^{-1}\frac{\lambda}{\mu}$
Equation 7.52 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)^2(s+\mu)[(s+\alpha)^2+\beta^2]}$	$\frac{1}{(\delta-\gamma)^2(\mu-\gamma)[(\alpha-\gamma)^2+\beta^2]}\left[(1)t+(18)-(1)\left\{\frac{2}{\delta-\gamma}+\frac{1}{\mu-\gamma}+\frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right]e^{-\gamma t}+\frac{(3)e^{-\mu t}}{(\gamma-\mu)^2(\delta-\mu)^2[(\alpha-\mu)^2+\beta^2]}$ $+\frac{1}{(\gamma-\delta)^2(\mu-\delta)[(\alpha-\delta)^2+\beta^2]}\left[(2)t+(19)-(2)\left\{\frac{2}{\gamma-\delta}+\frac{1}{\mu-\delta}+\frac{2(\alpha-\delta)}{(\alpha-\delta)^2+\beta^2}\right\}\right]e^{-\delta t}$ $+\frac{1}{\beta[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{(\mu-\alpha)^2+\beta^2}}\,e^{-\alpha t}\cos(\beta t-\psi)$ $\psi=\tan^{-1}\frac{(12)}{(13)}+2\tan^{-1}\frac{\beta}{\gamma-\alpha}+2\tan^{-1}\frac{\beta}{\delta-\alpha}+\tan^{-1}\frac{\beta}{\mu-\alpha}$

F(s)	f(t)
Equation 7.53 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)(s^2+\lambda^2)(s^2+\epsilon^2)}$	$\frac{1}{(\delta-\gamma)(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)}\left[(1)t+(18)-(1)\left\{\frac{1}{\delta-\gamma}-\frac{2\gamma}{\gamma^2+\lambda^2}-\frac{2\gamma}{\gamma^2+\epsilon^2}\right\}\right]e^{-\gamma t}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\delta^2+\lambda^2)(\delta^2+\epsilon^2)}$ $+\frac{1}{\lambda(\epsilon^2-\lambda^2)(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\delta^2+\lambda^2}}\cos(\lambda t-\psi_1)+\frac{1}{\epsilon(\lambda^2-\epsilon^2)(\gamma^2+\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{\delta^2+\epsilon^2}}\cos(\epsilon t-\psi_2)$ $\psi_1=\text{TAN}^{-1}\frac{(6)}{(7)}+2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}+\text{TAN}^{-1}\frac{\lambda}{\delta}\qquad\psi_2=\text{TAN}^{-1}\frac{(8)}{(9)}+2\,\text{TAN}^{-1}\frac{\epsilon}{\gamma}+\text{TAN}^{-1}\frac{\epsilon}{\delta}$
Equation 7.54 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]}$	$\frac{1}{(\delta-\gamma)(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]}\left[(1)t+(18)-(1)\left\{\frac{1}{\delta-\gamma}-\frac{2\gamma}{\gamma^2+\lambda^2}+\frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right]e^{-\gamma t}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\delta^2+\lambda^2)[(\alpha-\delta)^2+\beta^2]}$ $+\frac{1}{\lambda(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(\delta^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $+\frac{1}{\beta[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{[(\delta-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}e^{-\alpha t}\cos(\beta t-\psi_2)$ $\psi_1=\text{TAN}^{-1}\frac{(6)}{(7)}+2\,\text{TAN}^{-1}\frac{\lambda}{\gamma}+\text{TAN}^{-1}\frac{\lambda}{\delta}+\text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}\qquad\psi_2=\text{TAN}^{-1}\frac{(12)}{(13)}+\text{TAN}^{-1}\frac{\beta}{\delta-\alpha}+2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}-\text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)
Equation 7.55 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)(s^2+\lambda^2)^2}$	$\frac{1}{(\delta-\gamma)(\gamma^2+\lambda^2)^2}\left[(1)t+(18)-(1)\left\{\frac{1}{\delta-\gamma}-\frac{4\gamma}{\gamma^2+\lambda^2}\right\}\right]e^{-\gamma t}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2(\delta^2+\lambda^2)^2}$ $-\frac{1}{2\lambda^2(\gamma^2+\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\delta^2+\lambda^2}}\,t\cos(\lambda t+\psi_1)+\frac{1}{2\lambda^3(\gamma^2+\lambda^2)(\delta^2+\lambda^2)}\sqrt{\frac{(49)^2+(50)^2}{\gamma^2+\lambda^2}}\cos(\lambda t-\psi_2)$ $\psi_1=\tan^{-1}\frac{(7)}{(6)}-2\tan^{-1}\frac{\lambda}{\gamma}-\tan^{-1}\frac{\lambda}{\delta}\qquad\psi_2=\tan^{-1}\frac{(50)}{(49)}+3\tan^{-1}\frac{\lambda}{\gamma}+2\tan^{-1}\frac{\lambda}{\delta}$
Equation 7.56 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\frac{1}{(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]}\left[(1)t+(18)-(1)\left\{\frac{1}{\delta-\gamma}+\frac{2(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}+\frac{2(\sigma-\gamma)}{(\sigma-\gamma)^2+\tau^2}\right\}\right]e^{-\gamma t}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2[(\alpha-\delta)^2+\beta^2][(\sigma-\delta)^2+\tau^2]}$ $+\frac{1}{\beta[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{[(\delta-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\,e^{-\alpha t}\cos(\beta t-\psi_1)$ $+\frac{1}{\tau[(\gamma-\sigma)^2+\tau^2]}\sqrt{\frac{(14)^2+(15)^2}{[(\delta-\sigma)^2+\tau^2]\{[(\alpha-\sigma)^2-\tau^2+\beta^2]^2+4\tau^2(\alpha-\sigma)^2\}}}\,e^{-\sigma t}\cos(\tau t-\psi_2)$ $\psi_1=\tan^{-1}\frac{(12)}{(13)}+2\tan^{-1}\frac{\beta}{\gamma-\alpha}+\tan^{-1}\frac{\beta}{\delta-\alpha}+\tan^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}\qquad\psi_2=\tan^{-1}\frac{(14)}{(15)}+2\tan^{-1}\frac{\tau}{\gamma-\sigma}+\tan^{-1}\frac{\tau}{\delta-\sigma}+\tan^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$

F(s)	f(t)
Equation 7.57 $\frac{N_6(s)}{(s+\gamma)^2(s+\delta)[(s+\alpha)^2+\beta^2]^2}$	$\frac{1}{(\delta-\gamma)[(\alpha-\gamma)^2+\beta^2]^2}\left[(1)t+(18)-(1)\left\{\frac{1}{\delta-\gamma}+\frac{4(\alpha-\gamma)}{(\alpha-\gamma)^2+\beta^2}\right\}\right]e^{-\gamma t}+\frac{(2)e^{-\delta t}}{(\gamma-\delta)^2[(\alpha-\delta)^2+\beta^2]^2}$ $-\frac{1}{2\beta^2[(\gamma-\alpha)^2+\beta^2]}\sqrt{\frac{(12)^2+(13)^2}{(\delta-\alpha)^2+\beta^2}}\,te^{-\alpha t}\cos(\beta t+\psi_1)$ $\qquad \psi_1=\tan^{-1}\frac{(13)}{(12)}-2\tan^{-1}\frac{\beta}{\gamma-\alpha}-\tan^{-1}\frac{\beta}{\delta-\alpha}$ $-\frac{1}{2\beta^3[(\gamma-\alpha)^2+\beta^2][(\delta-\alpha)^2+\beta^2]}\sqrt{\frac{(51)^2+(52)^2}{(\gamma-\alpha)^2+\beta^2}}\,e^{-\alpha t}\cos(\beta t+\psi_2)$ $\qquad \psi_2=\tan^{-1}\frac{(52)}{(51)}-3\tan^{-1}\frac{\beta}{\gamma-\alpha}-2\tan^{-1}\frac{\beta}{\delta-\alpha}$
Equation 7.58 $\frac{N_6(s)}{(s+\gamma)(s^2+\lambda^2)(s^2+\epsilon^2)(s^2+k^2)}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)(\gamma^2+k^2)}+\frac{1}{\lambda(\epsilon^2-\lambda^2)(k^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\cos(\lambda t-\psi_1)$ $+\frac{1}{\epsilon(\lambda^2-\epsilon^2)(k^2-\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{\gamma^2+\epsilon^2}}\cos(\epsilon t-\psi_2)+\frac{1}{k(\lambda^2-k^2)(\epsilon^2-k^2)}\sqrt{\frac{(10)^2+(11)^2}{\gamma^2+k^2}}\cos(kt-\psi_3)$ $\psi_1=\tan^{-1}\frac{(6)}{(7)}+\tan^{-1}\frac{\lambda}{\gamma}$ $\qquad \psi_2=\tan^{-1}\frac{(8)}{(9)}+\tan^{-1}\frac{\epsilon}{\gamma}$ $\psi_3=\tan^{-1}\frac{(10)}{(11)}+\tan^{-1}\frac{k}{\gamma}$

F(s)	f(t)
Equation 7.59 $\frac{N_6(s)}{(s+\gamma)(s^2+\lambda^2)(s^2+\epsilon^2)[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)(\gamma^2+\epsilon^2)[(\alpha-\gamma)^2+\beta^2]} + \frac{1}{\lambda(\epsilon^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $+\frac{1}{\epsilon(\lambda^2-\epsilon^2)}\sqrt{\frac{(8)^2+(9)^2}{(\gamma^2+\epsilon^2)[(A^2-\epsilon^2)^2+4\alpha^2\epsilon^2]}}\cos(\epsilon t-\psi_2)$ $\psi_1=\tan^{-1}\frac{(6)}{(7)}+\tan^{-1}\frac{\lambda}{\gamma}+\tan^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $+\frac{1}{\beta}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2][(A^2-\epsilon^2)^2+4\alpha^2\epsilon^2]}}e^{-\alpha t}\cos(\beta t+\psi_3)$ $\psi_2=\tan^{-1}\frac{(8)}{(9)}+\tan^{-1}\frac{\epsilon}{\gamma}+\tan^{-1}\frac{2\alpha\epsilon}{A^2-\epsilon^2}$ $\psi_3=-\tan^{-1}\frac{(12)}{(13)}-\tan^{-1}\frac{\beta}{\gamma-\alpha}+\tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}+\tan^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\epsilon^2}$
Equation 7.60 $\frac{N_6(s)}{(s+\gamma)(s^2+\lambda^2)^2(s^2+\epsilon^2)}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)^2(\gamma^2+\epsilon^2)} - \frac{1}{2\lambda^2(\epsilon^2-\lambda^2)}\sqrt{\frac{(6)^2+(7)^2}{\gamma^2+\lambda^2}}\,t\cos(\lambda t+\psi_1)$ $+\frac{1}{\epsilon(\lambda^2-\epsilon^2)^2}\sqrt{\frac{(8)^2+(9)^2}{\gamma^2+\epsilon^2}}\cos(\epsilon t-\psi_3)+\frac{1}{2\lambda^3(\gamma^2+\lambda^2)(\epsilon^2-\lambda^2)^2}\sqrt{(53)^2+(54)^2}\cos(\lambda t-\psi_2)$ $\psi_1=\tan^{-1}\frac{(7)}{(6)}-\tan^{-1}\frac{\lambda}{\gamma}$ $\psi_2=\tan^{-1}\frac{(54)}{(53)}+2\tan^{-1}\frac{\lambda}{\gamma}$ $\psi_3=\tan^{-1}\frac{(8)}{(9)}+\tan^{-1}\frac{\epsilon}{\gamma}$

F(s)	f(t)
Equation 7.61 $\dfrac{N_6(s)}{(s+\gamma)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2]}$	$\dfrac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2]} + \dfrac{1}{\lambda}\sqrt{\dfrac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2][(B^2-\lambda^2)^2+4\sigma^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $+\dfrac{1}{\beta}\sqrt{\dfrac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2][\{(\sigma-\alpha)^2+\tau^2-\beta^2\}^2+4\beta^2(\sigma-\alpha)^2]}}e^{-\alpha t}\cos(\beta t-\psi_2)$ $+\dfrac{1}{\tau}\sqrt{\dfrac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2][(B^2-\lambda^2)^2+4\sigma^2\lambda^2][\{(\alpha-\sigma)^2+\beta^2-\tau^2\}^2+4\tau^2(\alpha-\sigma)^2]}}e^{-\sigma t}\cos(\tau t-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\dfrac{(6)}{(7)} + \text{TAN}^{-1}\dfrac{\lambda}{\gamma} + \text{TAN}^{-1}\dfrac{2\alpha\lambda}{A^2-\lambda^2} + \text{TAN}^{-1}\dfrac{2\sigma\lambda}{B^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\dfrac{(12)}{(13)} + \text{TAN}^{-1}\dfrac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\dfrac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2} + \text{TAN}^{-1}\dfrac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$ $\psi_3 = \text{TAN}^{-1}\dfrac{(14)}{(15)} + \text{TAN}^{-1}\dfrac{\tau}{\gamma-\sigma} - \text{TAN}^{-1}\dfrac{2\sigma\tau}{\sigma^2-\tau^2+\lambda^2} + \text{TAN}^{-1}\dfrac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}$

F(s)	f(t)
Equation 7.62 $\frac{N_6(s)}{(s+\gamma)(s^2+\lambda^2)[(s+\alpha)^2+\beta^2]^2}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)[(\alpha-\gamma)^2+\beta^2]^2} + \frac{1}{\lambda}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\cos(\lambda t-\psi_1)$ $-\frac{1}{2\beta^2}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\,t\,e^{-\alpha t}\cos(\beta t+\psi_2)$ $+\frac{1}{2\beta^3[(\gamma-\alpha)^2+\beta^2][(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(55)^2+(56)^2}\,e^{-\alpha t}\cos(\beta t-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(6)}{(7)} + \text{TAN}^{-1}\frac{\lambda}{\gamma} + \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(13)}{(12)} + \text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}$ $\psi_3 = \text{TAN}^{-1}\frac{(56)}{(55)} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - 2\,\text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)

Equation 7.63

$$\frac{N_6(s)}{(s+\gamma)[(s+\alpha)^2+\beta^2][(s+\sigma)^2+\tau^2][(s+\zeta)^2+\varphi^2]}$$

$$\frac{(1)e^{-\gamma t}}{[(\alpha-\gamma)^2+\beta^2][(\sigma-\gamma)^2+\tau^2][(\zeta-\gamma)^2+\varphi^2]}$$

$$+\frac{1}{\beta}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}\{[(\zeta-\alpha)^2-\beta^2+\varphi^2]^2+4\beta^2(\zeta-\alpha)^2\}}}\ e^{-\alpha t}\cos(\beta t-\psi_1)$$

$$+\frac{1}{\tau}\sqrt{\frac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2]\{[(\alpha-\sigma)^2-\tau^2+\beta^2]^2+4\tau^2(\alpha-\sigma)^2\}\{[(\zeta-\sigma)^2-\tau^2+\varphi^2]^2+4\tau^2(\zeta-\sigma)^2\}}}\ e^{-\sigma t}\cos(\tau t-\psi_2)$$

$$+\frac{1}{\varphi}\sqrt{\frac{(16)^2+(17)^2}{[(\gamma-\zeta)^2+\varphi^2]\{[(\alpha-\zeta)^2-\varphi^2+\beta^2]^2+4\varphi^2(\alpha-\zeta)^2\}\{[(\sigma-\zeta)^2-\varphi^2+\tau^2]^2+4\varphi^2(\sigma-\zeta)^2\}}}\ e^{-\zeta t}\cos(\varphi t-\psi_3)$$

$$\psi_1=\text{TAN}^{-1}\frac{(12)}{(13)}+\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha}+\text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}+\text{TAN}^{-1}\frac{2\beta(\zeta-\alpha)}{(\zeta-\alpha)^2-\beta^2+\varphi^2}$$

$$\psi_2=\text{TAN}^{-1}\frac{(14)}{(15)}+\text{TAN}^{-1}\frac{\tau}{\gamma-\sigma}+\text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2-\tau^2+\beta^2}+\text{TAN}^{-1}\frac{2\tau(\zeta-\sigma)}{(\zeta-\sigma)^2-\tau^2+\varphi^2}$$

$$\psi_3=\text{TAN}^{-1}\frac{(16)}{(17)}+\text{TAN}^{-1}\frac{\varphi}{\gamma-\zeta}+\text{TAN}^{-1}\frac{2\varphi(\alpha-\zeta)}{(\alpha-\zeta)^2-\varphi^2+\beta^2}+\text{TAN}^{-1}\frac{2\varphi(\sigma-\zeta)}{(\sigma-\zeta)^2-\varphi^2+\tau^2}$$

F(s)	f(t)
Equation 7.64 $\frac{N_6(s)}{(s+\gamma)(s^2+\lambda^2)^2[(s+\alpha)^2+\beta^2]}$	$\frac{(1)e^{-\gamma t}}{(\gamma^2+\lambda^2)^2[(\alpha-\gamma)^2+\beta^2]} - \frac{1}{2\lambda^2}\sqrt{\frac{(6)^2+(7)^2}{(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}}\, t\cos(\lambda t+\psi_1)$ $+\frac{1}{2\lambda^3(\gamma^2+\lambda^2)[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{(57)^2+(58)^2}\cos(\lambda t-\psi_2)$ $+\frac{1}{\beta[(A^2-\lambda^2)^2+4\alpha^2\lambda^2]}\sqrt{\frac{(12)^2+(13)^2}{(\gamma-\alpha)^2+\beta^2}}\, e^{-\alpha t}\cos(\beta t-\psi_3)$ $\psi_1 = \text{TAN}^{-1}\frac{(7)}{(6)} - \text{TAN}^{-1}\frac{\lambda}{\gamma} - \text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_2 = \text{TAN}^{-1}\frac{(58)}{(57)} + 2\,\text{TAN}^{-1}\frac{\lambda}{\gamma} + 2\,\text{TAN}^{-1}\frac{2\alpha\lambda}{A^2-\lambda^2}$ $\psi_3 = \text{TAN}^{-1}\frac{(12)}{(13)} + \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - 2\,\text{TAN}^{-1}\frac{2\alpha\beta}{\alpha^2-\beta^2+\lambda^2}$

F(s)	f(t)
Equation 7.65 $\dfrac{N_6(s)}{(s+\gamma)[(s+\alpha)^2+\beta^2]^2[(s+\sigma)^2+\tau^2]}$	$\dfrac{(1)e^{-\gamma t}}{[(\alpha-\gamma)^2+\beta]^2[(\sigma-\gamma)^2+\tau^2]}$

$$- \frac{1}{2\beta^2}\sqrt{\frac{(12)^2+(13)^2}{[(\gamma-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}}\; t\, e^{-\alpha t}\cos(\beta t+\psi_1)$$

$$+ \frac{1}{2\beta^3[(\gamma-\alpha)^2+\beta^2]\{[(\sigma-\alpha)^2-\beta^2+\tau^2]^2+4\beta^2(\sigma-\alpha)^2\}}\sqrt{(59)^2+(60)^2}\; e^{-\alpha t}\cos(\beta t-\psi_2)$$

$$+ \frac{1}{\tau}\sqrt{\frac{(14)^2+(15)^2}{[(\gamma-\sigma)^2+\tau^2]\{[(\alpha-\sigma)^2+\beta^2-\tau^2]^2+4\tau^2(\alpha-\sigma)^2\}}}\; e^{-\sigma t}\cos(\tau t-\psi_3)$$

$$\psi_1 = \text{TAN}^{-1}\frac{(13)}{(12)} - \text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} - \text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$$

$$\psi_2 = \text{TAN}^{-1}\frac{(60)}{(59)} + 2\,\text{TAN}^{-1}\frac{\beta}{\gamma-\alpha} + 2\,\text{TAN}^{-1}\frac{2\beta(\sigma-\alpha)}{(\sigma-\alpha)^2-\beta^2+\tau^2}$$

$$\psi_3 = \text{TAN}^{-1}\frac{(14)}{(15)} + \text{TAN}^{-1}\frac{\tau}{\gamma-\sigma} + \text{TAN}^{-1}\frac{2\tau(\alpha-\sigma)}{(\alpha-\sigma)^2+\beta^2-\tau^2}$$

ABBREVIATIONS

$N_6(s) = a_6s^6 + a_5s^5 + a_4s^4 + a_3s^3 + a_2s^2 + a_1s + a_0$ $N_6'(s) = 6a_6s^5 + 5a_5s^4 + 4a_4s^3 + 3a_3s^2 + 2a_2s + a$

$A^2 = \alpha^2 + \beta^2$ $B^2 = \sigma^2 + \tau^2$

$C^2 = \zeta^2 + \varphi^2$

(1) = $N_6(s)\Big|_{s=-\gamma}$ (2) = $N_6(s)\Big|_{s=-\delta}$

(3) = $N_6(s)\Big|_{s=-\mu}$ (4) = $N_6(s)\Big|_{s=-\eta}$

(5) = $N_6(s)\Big|_{s=-\rho}$

(6) + j(7) = $N_6(s)\Big|_{s=j\lambda}$ (8) + j(9) = $N_6(s)\Big|_{s=j\epsilon}$

(10) + j(11) = $N_6(s)\Big|_{s=jk}$ (12) + j(13) = $N_6(s)\Big|_{s=-\alpha+j\beta}$

(14) + j(15) = $N_6(s)\Big|_{s=-\sigma+j\tau}$ (16) + j(17) = $N_6(s)\Big|_{s=-\zeta+j\varphi}$

(18) = $N_6'(s)\Big|_{s=-\gamma}$ (19) = $N_6'(s)\Big|_{s=-\delta}$

(20) = $N_6'(s)\Big|_{s=-\mu}$ (21) + j(22) = $N_6'(s)\Big|_{s=j\lambda}$

(23) + j(24) = $N_6'(s)\Big|_{s=-\alpha+j\beta}$

(25) = $\lambda[\lambda(22) + 4(6)] - \gamma[\lambda(21) - 3(7)]$

(26) = $\lambda[\lambda(21) - 4(7)] + \gamma[\lambda(22) + 3(6)]$

(27) = $(\gamma-\alpha)\{\beta[\beta(23) - 3(13)] - \alpha[\beta(24) + (12)]\} - \beta\{\beta[\beta(24) + 4(12)] + \alpha[\beta(23) - 2(13)]\}$

(28) = $(\gamma-\alpha)\{\beta[\beta(24) + 3(12)] + \alpha[\beta(23) - (13)]\} + \beta\{\beta[\beta(23) - 4(13)] - \alpha[\beta(24) + 2(12)]\}$

(29) = $\lambda(\gamma+\delta)[\lambda(21) - 3(7)] + (\gamma\delta - \lambda^2)[\lambda(22) + 2(6)] - 2\lambda^2(6)$

(30) = $\lambda(\gamma+\delta)[\lambda(22) + 3(6)] - (\gamma\delta - \lambda^2)[\lambda(21) - 2(7)] - 2\lambda^2(7)$

$$(31) = [(\gamma-\alpha)(\delta-\alpha)-\beta^2]\{\beta[\beta(24)+2(12)]+\alpha[\beta(23)-(13)]\}+\beta[(\gamma-\alpha)+(\delta-\alpha)]\{\beta[\beta(23)-3(13)]-\alpha[\beta(24)+2(12)]\}$$
$$+2\beta^2[\alpha(13)-\beta(12)]$$

$$(32) = [(\gamma-\alpha)(\delta-\alpha)-\beta^2]\{\beta[\beta(23)-2(13)]-\alpha[\beta(24)+(12)]\}-\beta[(\gamma-\alpha)+(\delta-\alpha)]\{\beta[\beta(24)+3(12)]+\alpha[\beta(23)-2(13)]\}$$
$$+2\beta^2[\beta(13)+\alpha(12)]$$

$$(33) = \lambda[\lambda(21)-4(7)]+\gamma[\lambda(22)+2(6)]$$

$$(34) = \lambda[\lambda(22)+4(6)]-\gamma[\lambda(21)-2(7)]$$

$$(35) = (\gamma-\alpha)\{\beta[\beta(24)+2(12)]+\alpha[\beta(23)-(13)]\}+\beta\{\beta[\beta(23)-4(13)]-\alpha[\beta(24)+3(12)]\}$$

$$(36) = (\gamma-\alpha)\{\beta[\beta(23)-2(13)]-\alpha[\beta(24)+(12)]\}-\beta\{\beta[\beta(24)+4(12)]+\alpha[\beta(23)-3(13)]\}$$

$$(37) = (A^2-\lambda^2)[\lambda(22)+2(6)]+2\alpha\lambda[\lambda(21)-3(7)]-2\lambda^2(6)$$

$$(38) = (A^2-\lambda^2)[\lambda(21)-2(7)]-2\alpha\lambda[\lambda(22)+3(6)]+2\lambda^2(7)$$

$$(39) = (\epsilon^2-\lambda^2)[\lambda(22)+2(6)]-2\lambda^2(6)$$

$$(40) = (\epsilon^2-\lambda^2)[\lambda(21)-2(7)]+2\lambda^2(7)$$

$$(41) = (\alpha^2-\beta^2+\lambda^2)\{\beta[\beta(24)+2(12)]+\alpha[\beta(23)-(13)]\}-2\alpha\beta\{\beta[\beta(23)-4(13)]-\alpha[\beta(24)+2(12)]\}-2\beta^3(12)$$

$$(42) = (\alpha^2-\beta^2+\lambda^2)\{\beta[\beta(23)-2(13)]-\alpha[\beta(24)+(12)]\}+2\alpha\beta\{\beta[\beta(24)+4(12)]+\alpha[\beta(23)-2(13)]\}+2\beta^3(13)$$

$$(43) = [(\sigma-\alpha)^2-\beta^2+\tau^2]\{\beta[\beta(24)+2(12)]+\alpha[\beta(23)-(13)]\}+2\beta(\sigma-\alpha)\{\beta[\beta(23)-3(13)]-\alpha[\beta(24)+2(12)]\}$$
$$-2\beta^2[\beta(12)-\alpha(13)]$$

$$(44) = [(\sigma-\alpha)^2-\beta^2+\tau^2]\{\beta[\beta(23)-2(13)]-\alpha[\beta(24)+(13)]\}-2\beta(\sigma-\alpha)\{\beta[\beta(24)+3(13)]+\alpha[\beta(23)-2(13)]\}$$
$$+2\beta^2[\beta(13)+\alpha(12)]$$

$$(45) = (\gamma\delta-\lambda^2)\{\lambda[\lambda(22)+2(6)]-\mu[\lambda(21)-(7)]\}+\lambda(\gamma+\delta)\{\lambda[\lambda(21)-2(7)]+\mu[\lambda(22)+(6)]\}$$
$$+\lambda\{(6)[(\delta\mu-\lambda^2)+(\gamma\mu-\lambda^2)]-\lambda(7)[(\delta+\mu)+(\gamma+\mu)]\}$$

$$(46) = (\gamma\delta-\lambda^2)\{\lambda[\lambda(21)-2(7)]+\mu[\lambda(22)+(6)]\}-\lambda(\gamma+\delta)\{\lambda[\lambda(22)+2(6)]-\mu[\lambda(21)-(7)]\}$$

$$-\lambda\{(7)[(\delta\mu-\lambda^2)+(\gamma\mu-\lambda^2)]+\lambda(6)[(\delta+\mu)+(\gamma+\mu)]\}$$

$$(47) = [(\gamma-\alpha)(\delta-\alpha)-\beta^2]\{\beta[\beta(24)+(12)]-(\mu-\alpha)[\beta(23)-(13)]\}+\beta[(\gamma-\alpha)+(\delta-\alpha)]\{\beta[\beta(23)-(13)]+(\mu-\alpha)[\beta(24)+(12)]\}$$

$$+\beta(12)[(\gamma\delta-\beta^2)+(\gamma\mu-\beta^2)+(\delta\mu-\beta^2)]-2\beta^2(\gamma+\delta+\mu)(13)$$

$$(48) = [(\gamma-\alpha)(\delta-\alpha)-\beta^2]\{\beta[\beta(23)-(13)]+(\mu-\alpha)[\beta(24)+(12)]\}-\beta[(\gamma-\alpha)+(\delta-\alpha)]\{\beta[\beta(24)+(12)]-(\mu-\alpha)[\beta(23)-(13)]\}$$

$$-\beta(13)[(\gamma\delta-\beta^2)+(\gamma\mu-\beta^2)+(\delta\mu-\beta^2)]-2\beta^2(\gamma+\delta+\mu)(12)$$

$$(49) = \lambda(\gamma+\delta)[\lambda(22)+2(6)]-(\gamma\delta-\lambda^2)[\lambda(21)-(7)]+\lambda[\delta(6)-3\lambda(7)]$$

$$(50) = \lambda(\gamma+\delta)[\lambda(21)-2(7)]+(\gamma\delta-\lambda^2)[\lambda(22)+(6)]-\lambda[\delta(7)+3\lambda(6)]$$

$$(51) = [(\gamma-\alpha)(\delta-\alpha)-\beta^2][\beta(23)-(13)]-\beta[(\gamma-\alpha)+(\delta-\alpha)][\beta(24)+2(12)]+\beta[3\beta(13)-(\delta-\alpha)(12)]$$

$$(52) = [(\gamma-\alpha)(\delta-\alpha)-\beta^2][\beta(24)+(12)]+\beta[(\gamma-\alpha)+(\delta-\alpha)][\beta(23)-2(13)]-\beta[3\beta(12)+(\delta-\alpha)(13)]$$

$$(53) = (\epsilon^2-\lambda^2)\{\lambda[\lambda(22)+2(6)]-\gamma[\lambda(21)-(7)]\}-2\lambda^2[\lambda(6)+\gamma(7)]$$

$$(54) = (\epsilon^2-\lambda^2)\{\lambda[\lambda(21)-2(7)]+\gamma[\lambda(22)+(6)]\}+2\lambda^2[\lambda(7)-\gamma(6)]$$

$$(55) = \beta[(\alpha^2-\beta^2+\lambda^2)-2\alpha(\gamma-\alpha)][\beta(24)+2(12)]-[(\gamma-\alpha)(\alpha^2-\beta^2+\lambda^2)+2\alpha\beta^2][\beta(23)-(13)]-2\beta^2[\beta(12)+(\gamma-3\alpha)(13$$

$$(56) = \beta[(\alpha^2-\beta^2+\lambda^2)-2\alpha(\gamma-\alpha)][\beta(23)-2(13)]+[(\gamma-\alpha)(\alpha^2-\beta^2+\lambda^2)+2\alpha\beta^2][\beta(24)+(12)]+2\beta^2[\beta(13)-(\gamma-3\alpha)(12)]$$

$$(57) = (A^2-\lambda^2)\{\lambda[\lambda(22)+2(6)]-\gamma[\lambda(21)-(7)]\}+2\lambda\{\gamma\lambda[\alpha(22)-(7)]+\alpha\lambda[\lambda(21)-3(7)]+(2\alpha\gamma-\lambda^2)(6)\}$$

$$(58) = (A^2-\lambda^2)\{\lambda[\lambda(21)-2(7)]+\gamma[\lambda(22)+(6)]\}-2\lambda\{\alpha\lambda[\lambda(22)+3(6)]-\gamma\lambda[\alpha(21)-(6)]+(2\alpha\gamma-\lambda^2)(7)\}$$

$$(59) = \beta\{[(\sigma-\alpha)^2-\beta^2+\tau^2]+2(\gamma-\alpha)(\sigma-\alpha)\}[\beta(24)+2(12)]-\{(\gamma-\alpha)[(\sigma-\alpha)^2-\beta^2+\tau^2]-2\beta^2(\sigma-\alpha)\}[\beta(23)-(13)]$$

$$-2\beta^2\{\beta(12)+[(\gamma-\alpha)+2(\sigma-\alpha)](13)\}$$

$$(60) = \beta\{[(\sigma-\alpha)^2-\beta^2+\tau^2]+2(\gamma-\alpha)(\sigma-\alpha)\}[\beta(23)-2(13)]+\{(\gamma-\alpha)[(\sigma-\alpha)^2-\beta^2+\tau^2]-2\beta^2(\sigma-\alpha)\}[\beta(24)+(12)]$$

$$+2\beta^2\{\beta(13)-[(\gamma-\alpha)+2(\sigma-\alpha)](12)\}$$

Section 9. Equations 8.1 to 8.6

F(s)	f(t)
Equation 8.1 $\frac{N(s)}{\prod_{x=1}^{M}(s+s_x)}$	$\sum_{n=1}^{M} k_n e^{-s_n t}$ $k_n = \left[F(s)(s+s_n) \right]_{s=-s_n}$
Equation 8.2 $\frac{N(s)}{\prod_{m=1}^{M}[(s+\alpha_m)^2+\beta_m^2]}$	$\sum_{m=1}^{M} 2\sqrt{X_m^2+Y_m^2}\; e^{-\alpha_m t} \cos(\beta_m t + \text{TAN}^{-1}\frac{Y_m}{X_m})$ $X_m + jY_m = \left[F(s)(s+\alpha_m - j\beta_m)\right]_{s=-\alpha_m+j\beta_m}$
Equation 8.3 $\frac{N(s)}{s^R D(s)}$	$\sum_{n=1}^{R} \frac{t^{n-1}}{(n-1)!\,(R-n)!} \left[\frac{d^{R-n}}{ds^{R-n}}(s^R F(s))\right]_{s=0}$ + Remainder (t
Equation 8.4 $\frac{N(s)}{(s+\gamma)^R D(s)}$	$e^{-\gamma t} \sum_{n=1}^{R} \frac{t^{n-1}}{(n-1)!\,(R-n)!} \left[\frac{d^{R-n}}{ds^{R-n}}[(s+\gamma)^R F(s)]\right]_{s=-\gamma}$ + Remainder (t
Equation 8.5 $\frac{N(s)}{[(s+\alpha)^2+\beta^2]^R D(s)}$	$e^{-\alpha t} \sum_{n=1}^{R} \frac{2t^{n-1}}{(n-1)!\,(R-n)!} \sqrt{X_n^2+Y_n^2} \cos(\beta t + \text{TAN}^{-1}\frac{Y_n}{X_n})$ + Remainder (t) $X_n + jY_n = \left[\frac{d^{R-n}}{ds^{R-n}}[(s+\alpha-j\beta)^R F(s)]\right]_{s=-\alpha+j\beta}$

F(s)	f(t)
Equation 8.6 $\dfrac{N(s)}{(s^2+\lambda^2)^n D(s)}$	$\displaystyle\sum_{n=1}^{n} \frac{2\,t^{n-1}}{(n-1)!\,(n-n)!} \sqrt{X_n^2 + Y_n^2}\ \cos\left(\lambda t + \text{TAN}^{-1}\frac{Y_n}{X_n}\right)$ $+$ Remainder(t) $X_n + j\,Y_n = \left[\dfrac{d^{n-n}}{ds^{n-n}}\left[(s-j\lambda)^n F(s)\right]\right]_{s=j\lambda}$

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